NOV -8 1954

AMERICAN

# Gas Journal

90th year

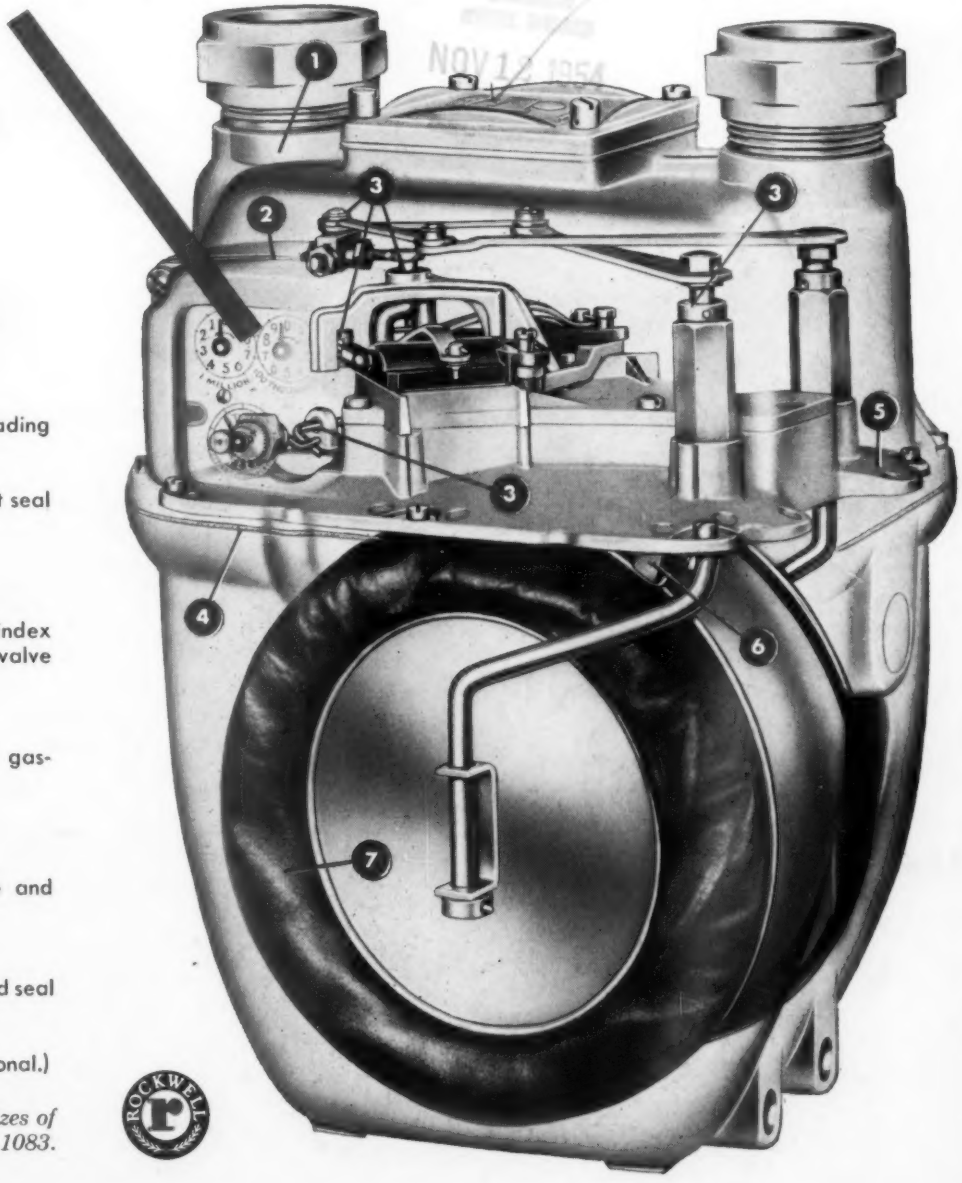
SEPTEMBER 19

Vol. 181—No. 3


## Rockwell 150 Aluminum Meter

Capacity 150 cfh (at ½-in. diff. of 0.60 sp. gr. gas) Weight 13 lb.

## Set your sights on these QUALITY FEATURES



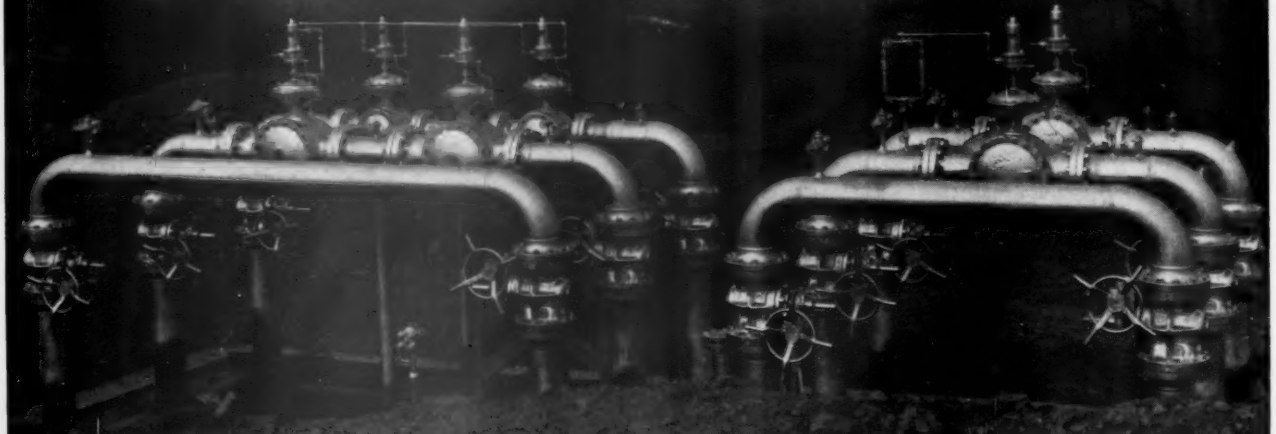

1. **Steel Spud Inserts**
   For added strength, gall-proof threading
2. **Gasketed Index Box**
   Provides a waterproof pressure tight seal for the index
3. **Oil Impregnated Powdered Bronze Bushings**
   On crank bracket, tangent post, index shaft, crank bearing, flag collars, valve wire guides
4. **Single Joint Construction**
   Minimizes leakage risks. Only one gasketed joint
5. **Interchangeable Valve Plate Mechanism**
   Speeds and simplifies maintenance and repairs
6. **Diaphragm Ring Clamp**
   Screw driven for maximum tension and seal
7. **Diaphragm**
   Imported sheepskin (Synthetic is optional.)

*Read all about the "150" and other sizes of Rockwell domestic meters in bulletin 1083. Write for your copy today.*

**ROCKWELL MANUFACTURING COMPANY** Pittsburgh 8, Pa. Atlanta Boston Chicago Dallas Houston
N. Kansas City, Mo. Los Angeles New York Philadelphia Pittsburgh San Francisco Seattle Tulsa
*Canadian Gas Products Sales:* Peacock Brothers Limited

# They're Building Right!

## FROM THE GROUND UP



## with ROCKWELL "015" High Pressure REGULATORS and ROCKWELL-NORDSTROM Lubricant Sealed VALVES

New Regulating Station Being Erected by a Pennsylvania Gas Utility.

Want the finest degree of pressure control; the ultimate in easy, sure, long lasting valve operation? Then build your new stations around Rockwell "015" regulators and Nordstrom valves.

Consider the exclusive advantages in these two Rockwell-built products. The regulators are readily adaptable to meet changing conditions. Any of six control systems (see below) can be applied to the same basic body. And the interchangeable inlet bowl feature permits sizing regulator capacity up or down to meet increased or decreased needs.

Nordstrom valves are lubricant-sealed to assure a safe, complete closure even when operated infrequently. They turn easily — outlast, outperform all other types on gas service.

Complete technical information on these pressure-guarding Rockwell products is available in bulletins that you may request. Or ask the Rockwell salesman. Write us and he he will see you.

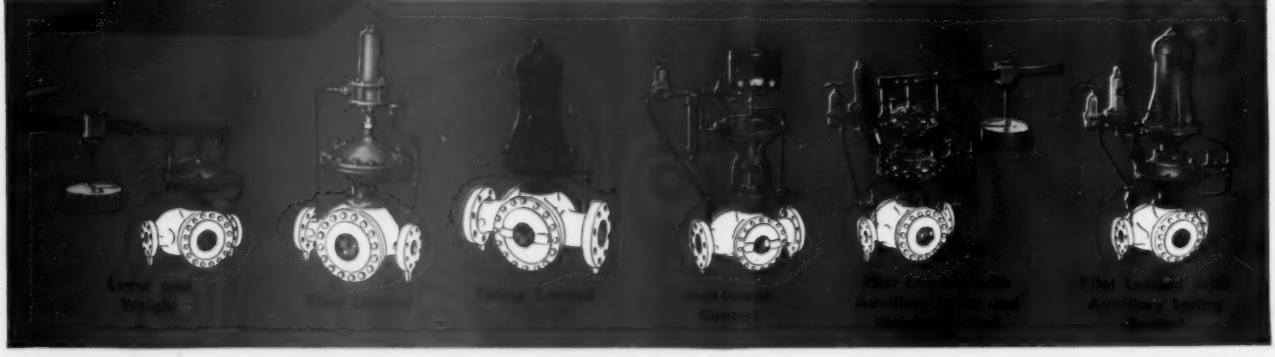
YOU CAN RELY ROCKWELL ON ROCKWELL

**ROCKWELL MANUFACTURING COMPANY**

PITTSBURGH 8, PA. Atlanta Boston Chicago Houston Los Angeles New York N. Kansas City Philadelphia Pittsburgh San Francisco Seattle Tulsa

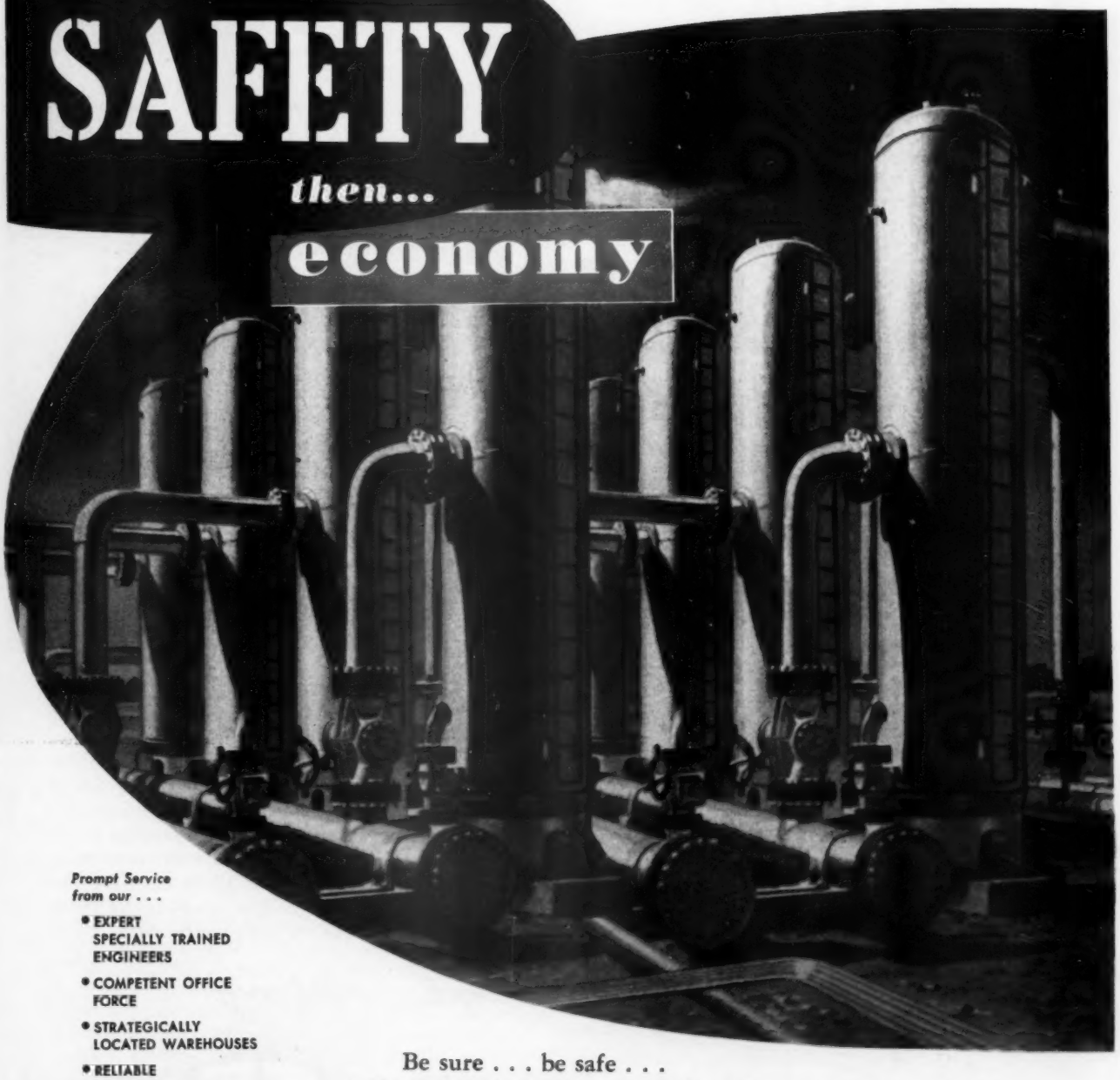
*In Canada: Peacock Brothers Limited*

ANY OF THESE CONTROL SYSTEMS APPLY TO THE SAME BASIC REGULATOR BODY



NOV -8 1954


# SAFETY
*then...*
## economy



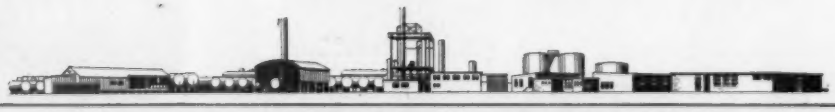
*Prompt Service from our . . .*

- EXPERT SPECIALLY TRAINED ENGINEERS
- COMPETENT OFFICE FORCE
- STRATEGICALLY LOCATED WAREHOUSES
- RELIABLE SHIPPING SERVICE

Be sure . . . be safe . . .
Let SPECIALISTS in the Field give you the technical assistance you need in all phases of odorization and odorant handling.

captan

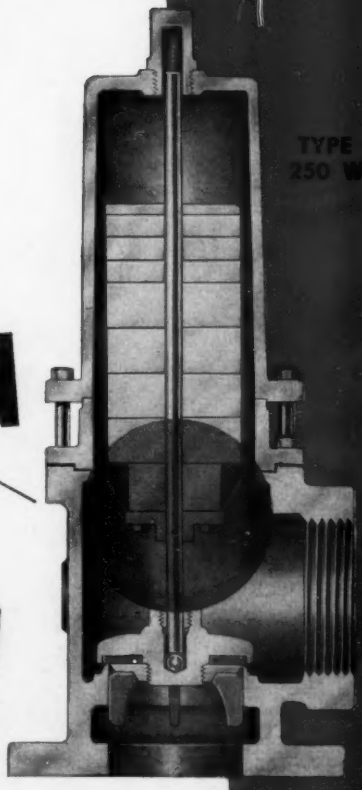
CALL OR WIRE for one of our CAPTAN Engineers to visit you at your convenience.

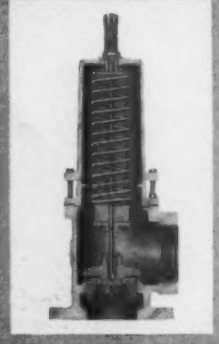


**NATURAL GAS ODORIZING CO., INC.**

P. O. BOX 1645 HOUSTON, TEXAS

# WHAT A DIFFERENCE A "D" MAKES in the NEW CHAPLIN-FULTON High Capacity Safety Valves



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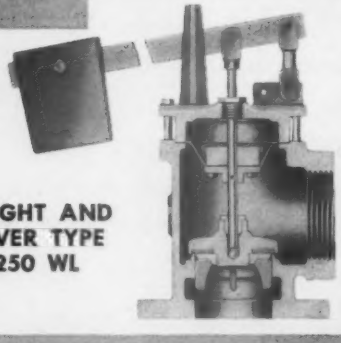

WEIGHT AND
LEVER TYPE
250 WL

SV-53-1

"D" stands for diaphragm, and what a difference it makes in the discharge ability of the new Chaplin-Fulton High Capacity Safety Valves—2½ times more flow capacity. After initial opening, the discharge pressure acting upward on the diaphragm insures maximum opening, and guarantees full flow with minimum increase in in the blowing pressure. This means greater protection for the users of Chaplin-Fulton Type 250 Safety Valves, adaptable in three models to all gas systems from ounces to 100 pounds. Sizes 2″ to 6″ inclusive.

*Simple.... Foolproof*

ACCURATE CP MFG CO DEPENDABLE

Chaplin-Fulton
MANUFACTURING COMPANY
Pittsburgh 23, Pennsylvania


**AMERICAN GAS JOURNAL**, September, 1954. Vol. 181, No. 3. Published monthly (except October, then semi-monthly), by American Gas Journal Inc., at 73 Main Street, Brattleboro, Vt. Entered as second class matter January 24, 1950, at the post office at Brattleboro, Vt. under Act of March 3, 1879. Executive and editorial offices at 205 East 42nd St., New York 17, New York. Subscription prices, U.S. $3 per year; Canada $4; Foreign $10. Single copies 50 cents, except October 1 issue, which is not sold separately. Printed in U.S.A.

AMERICAN Gas Journal
96TH YEAR OF PUBLICATION

VOLUME 181 SEPTEMBER 1954 NUMBER 3

## This month...

Junking 20,000 meters seems, to us, a rather bold decision. That did not deter Hansell Hillyer, president of South Atlantic Gas Co., after he analyzed a study of just such a move. Operating economies, tax savings and public relations advantages were dominant factors in the decision. As the understatement of this issue, we observe that it is not every day that some gas company or other places an order for 20,000 meters. Gas company executives might well find an inspiration in the summary of "how-it-was-done" in Savannah. Page 14.

• • •

Public relations for the gas industry has been a topic on which the GAS JOURNAL has ding-donged for 5 years—and the end is not yet. Adequate and realistic efforts to create a beneficial operating climate for the industry have a definite potential for payoff. With some rather deep-seated convictions in mind, we interviewed W. E. Wilson, who heads the public information advisory committee of Independent Natural Gas Association of America, to get his views on the subject and a summary of the association's program. Page 15.

• • •

Every now and then, editors find reward in gratifying reader-reactions—thereby establishing the exceptions to the impression that they just talk to themselves. We have just had a series of such rewards in the reactions to our new feature, Current Gas Industry Topics, started in July. Our purpose, to communicate in condensed form a wide variety of information so that gas industry people will be aware of the excellent presentations that are available, seems to have a good measure of fulfilment. This month's Topics include industrial gas sales, corrosion, management, metering, odorization, employee relations and distribution. Page 17.

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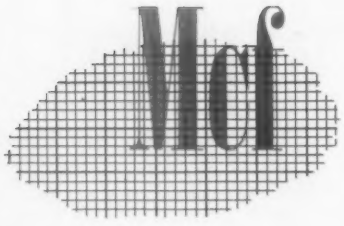


NEW NORTHWEST DEAL IN TALK-TALK

**Look for substantial reshuffling of the previously-uncertain project to deliver natural gas to the Northwest. Pacific Northwest Pipeline Corporation, holder of Federal Power Commission's certificate for New Mexico-to-Oregon and Washington line, is reported in serious talks with Westcoast Transmission Company, one of rejected applicants, to combine on the project. Pacific would take it through Idaho; Northwest to go the rest of route. Added twist in new project: joint, Pacific-Westcoast, spur to northern California.**

FINANCING difficulties are assumed to be at the root of reported change in Pacific Northwest's certificated project. That would be in line with GAS JOURNAL information (reported and editorialized, July and August 1954). No evidence yet on how new deal changes basic economic factors for high-construction-cost, long-haul project.

**CANADIAN gas is not indicated for reshuffled project. Word from Washington has Canadians raising some kind of hell there. Remember . . . FPC Chairman Kuykendall said Pacific Northwest area could be better and more cheaply served by southern Alberta gas. Official Canadian export approval with long-term dependability was lacking then. Could be that ultra-long-shot second chance for Canadian gas is coming up. Recommendation: don't bet on it.**

ELECTRIC service in Northeast was notable during late-August hurricane for the blanket story of outages and consequent difficulties. One leading gas industry executive, with wide renown for culinary-accomplishment, fed his kilowetted neighbors. He fed them well, too, with specialties from top gas burners . . . kitchen had 18" of sea water, so oven and broiler were temporarily out-of-service.

**CHANGES in gas utility service characteristics were high-spotted by Sheldon Coleman, GAMA president, when he told Pacific Coast Gas Association convention, this month, he didn't "believe there is a gas utility . . . [that] wants to experiment with operating a heating business alone. Yet there are figures available which show an increasing number of electric ranges being installed along gas distribution lines . . . gas utility industry is adding househeating customers faster than they are adding new cooking customers."**

BANG-BANG finish of Coleman's address to PCGA rates cross-country reading—and assimilation: "Has too much been said about action? . . . emphatically NO—but it is high time we used fewer words and created more action . . . that we stopped talking about problems—and solved them. It's high time each of us considered the Action Program as part of our everyday business routine. . . . Action, more than words; performance, not complacency; accomplishment, not defeatism; success, not excuses."

**SERVEL, Inc. has new president. He is Duncan Cameron Menzies; also general manager and a director. Louis Ruthenburg continues as chairman of board; W. Paul Jones is now vice chairman.**

RESEARCH is credited with being the most important factor "making for change that creates a need for capital goods," says *Fortune*. Government and business spent less than $1-billion on research and employed 87,000 engineers and scientists in 1941. In 1953, expenditures were about $4-billions of which $2.8-billions were accounted for by industry, and 192,000 engineers and scientists were employed. By 1959 research expenditures may reach $5.5-billions.

**WATCH these bills, active in 83d Congress and subject to revival in 84th: *Hunt* (S. 1287), exporting and importing of natural gas would be prohibited if "found" to affect national economy adversely . . . *Dirksen* (S. 525), relates particularly to underground storage of natural gas and *eminent domain* provisions of Natural Gas Act . . . *Long* (S. 3315), relates to financing of municipal gas, sewage and water systems under municipal bonds with Federal guarantees . . . *Lyle* (H.R. 2120) and *Rogers* (H.R. 9923), both deal with exemptions of producers and gatherers from Natural Gas Act provisions.**

GROSS national product for 2d quarter of 1954, on seasonally-adjusted basis, show personal consumption expenditures at all-time peak of $233-billion annual rate. That's $2.5-billions above rate for 1st quarter, says Guaranty Trust Company of New York. Higher total attributed almost wholly to public's tendency to spend more from current income.

**CONFERENCE on Economic Progress will bear watching, based on comments by First National Bank of Boston. This outfit is reported as spearheading freshened-up spending philosophy by Government as a panacea for national economic ills. It hopes to enlist support of labor, farmers, liberals, low-income groups by advocating constant increase in wages, maintenance of prices except for agricultural products, lower income taxes for lower-income groups and liberalized social security provisions for pensions and unemployment. That name, again: Conference on Economic Progress.**

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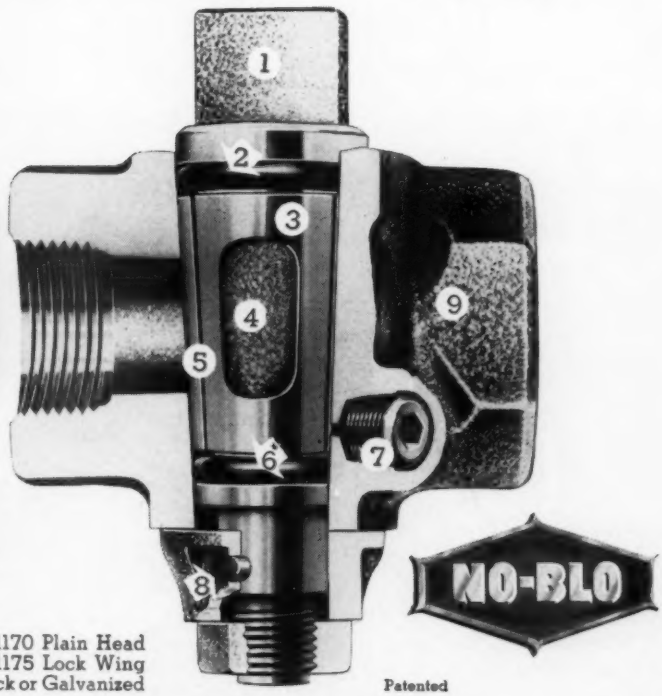
# MUELLER

## LubOseal® gas meter stops

Tamperproof...

Positive Lubrication...

Doubly Safe...




H-11170 Plain Head
H-11175 Lock Wing
Black or Galvanized

Patented

Now sizes ¾" through 2½" Shipment from stock

You can be certain that you are installing an absolutely safe gas stop when you install the Mueller LubOseal Stop. *And* these features assure you that many years from now the LubOseal will be just as safe and dependable as it is today!

1. Low Turning Torque—factory adjusted within precise limits.

2. "O" Ring Seals—give a positive seal at top and bottom of key . . . will not deteriorate. Laboratory tested to 4800 psig without leakage to atmosphere.

3. Ground and Lapped Key—assures positive shut-offs . . . generous sealing surfaces . . . precision machined . . . ground and lapped into body.

4. False Ports—protect highly finished ground key surfaces . . . cast in key and body . . . line up with true ports in off position.

5. Lubricant Grooves—provide 100% lubrication of all surfaces whenever stop is opened or closed. . . proportioned so that grease is not forced out when passing ports.

6. Lubricant Reservoir—maintains constant pressure on grease in vertical grooves . . . perfect lubrication over long periods assured by storing lubricant, under pressure, by "O" rings.

7. Lubrication Plug—affords easy means of relubrication . . . socket head requires uncommon tool . . . discourages tampering. Protected from gas.

8. Tamperproof—steel pin is drive-locked into blind hole in washer through enlarged key stem section . . . severe overtightening of nut will strip threads but not break stem or shear pin. Stop will remain perfectly gas tight with nut removed.

9. Iron Body—heavy grey iron casting . . . furnishes maximum strength . . . withstands many times normal operating pressures.

*Write direct for particulars and samples.*

**MUELLER CO.**

*Dependable Since 1857*

MAIN OFFICE & FACTORY DECATUR, ILLINOIS

**LINE STOPPER FITTINGS**

No-Blo Line Stopper Fittings — welding or mechanical joint type — are used with the "CC" or "C-1" and auxiliary line stopper equipment to stop-off lines to permit repair or replacement without loss of gas or interruption of service. Sizes 3", 4", 6", 8", 10" and 12". Available with series 15, 30, 40, 60 and 90 flanges.

**FLANGED TEE**

No-Blo Flanged Tees, with welding inlet and outlet and "O" Ring Seal Completion Plugs, are used to make large main connections or run a lateral. Inlet end is contoured to fit pipe one size larger than tee. Sizes 3", 4", 6" and 8". Available with series 15, 30, 40, 60 and 90 flanges.

**"SAVE-A-VALVE" DRILLING NIPPLE**

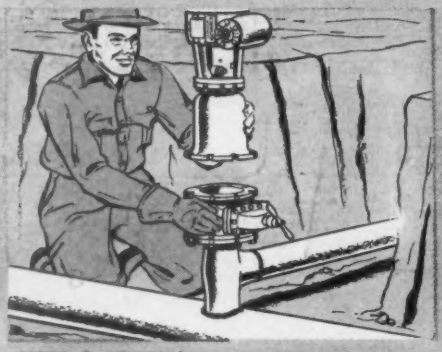
No-Blo "Save-A-Valve" Drilling Nipples-used to make temporary connections when it is desirable to recover the valve. Flanged type in sizes 4", 6" and 8". Inlet end contoured to fit pipe one size larger than nipple. Available with series 15, 30, 40, 60 and 90 flanges.

**TAPPING SLEEVE AND VALVE**

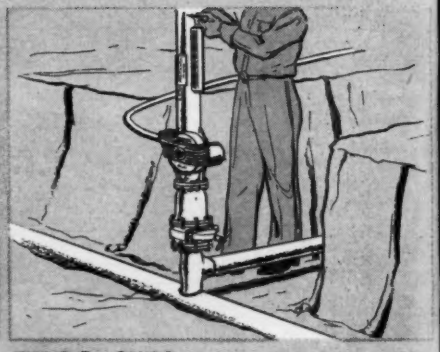
Mueller No-Blo Tapping Sleeves and "O" Ring Seal Tapping Valves — regular or mechanical joint type — are used for making lateral main connections under pressure without loss of gas or interruption of flow in main. A complete range of sizes.

# CONNECT LATERAL MAINS SAFELY UNDER PRESSURE

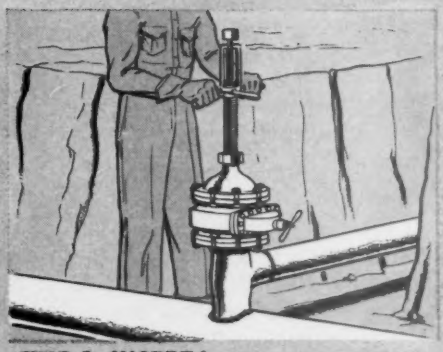
**STEP 1. *WELD!*** WELD FLANGED TEE FITTING TO MAIN. WELD NEW LATERAL TO OUTLET OF TEE. COMPLETE LATERAL TO FIRST VALVE. TEST. BOLT *MUELLER* GATE VALVE TO FLANGE OF FITTING.



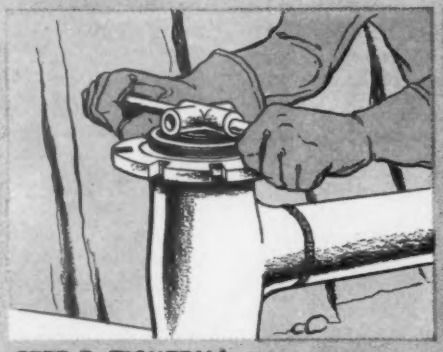
**STEP 2. *BOLT!*** FASTEN ADAPTER, PILOT DRILL AND SHELL CUTTER TO DRILLING MACHINE. COAT SHELL CUTTER WITH *MUELLER* CUTTING GREASE. OPEN GATE VALVE AND BOLT DRILLING MACHINE TO VALVE.



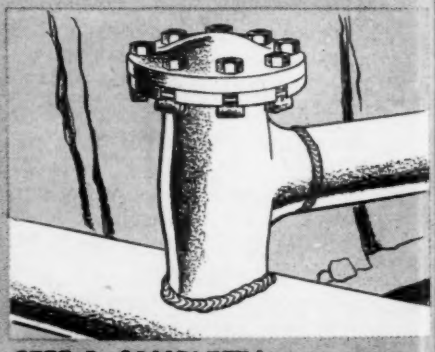
**STEP 3. *CUT!*** ADVANCE BORING BAR UNTIL PILOT DRILL STRIKES MAIN. SET FEED INDICATOR TO ZERO AND ENGAGE AUTOMATIC FEED. (ATTACH POWER UNIT TO "C-1"). MAKE CUT, RETRACT CUTTER WHICH RETAINS COUPON, CLOSE VALVE AND REMOVE DRILLING MACHINE.



**STEP 4. *INSERT!*** ATTACH COMPLETION PLUG TO THRUST BAR OF COMPLETION MACHINE AND BOLT MACHINE TO GATE VALVE. OPEN VALVE AND INSERT COMPLETION PLUG. REMOVE MACHINE AND VALVE.



**STEP 5. *TIGHTEN!*** TIGHTEN PLUG SOLIDLY IN TEE WITH SPECIAL WRENCH AND SHORT LENGTH OF PIPE OR ROD. TEST JOINT WITH SOAP SUDS.



**STEP 6. *COMPLETE!*** PLACE GASKET ON FLANGE AND BOLT COMPLETION CAP SOLIDLY IN PLACE. TEE INSTALLATION IS NOW COMPLETE.

**MUELLER NO-BLO Method**

*This is another of a series showing the broad application of Mueller No-Blo Fittings and the machines used for their installation.*

# MUELLER

## with the "CC" and "C-1" DRILLING MACHINES!

Lateral main connections may be made safely and easily with the Mueller "CC" or "C-1" Drilling Machines and "Save-A-Valve" Drilling Nipples, Flanged Tees, Tapping Sleeves and Valves or any standard gate valve. Both the hand-operated "CC" and the power-operated "C-1" will make cuts from 2" to 12". Tools may be fed manually or automatically. Feed indicators are standard equipment. Boring bar travel is 36". Maximum working pressure is 500 psi at 100°F. Maximum working temperautre is 500°F at 250 psi. Power for the "C-1" is supplied by the H-600 Air Motor or the easily-transportable H-602 Gasoline Engine Drive Unit.

*For additional information regarding the "CC" and "C-1" and related No-Blo Fittings, consult your Mueller Representative or write direct.*

**MUELLER CO.**

*Dependable Since 1857*

MAIN OFFICE & FACTORY DECATUR, ILLINOIS

# There's no customer

Ewing Galloway

This is Baltimore—a thriving city of nearly a million population.

Bettmann Archive

This is a view of Baltimore, from Federal Hill, as it looked about 100 years ago.

## MODERNIZED cast iron

# like an old customer!

## BALTIMORE'S Consolidated Gas Electric Light and Power Company bought cast iron pipe 100 years ago... and buys it today.

**The first gas franchise in America was granted to The Gas Light Company of Baltimore, predecessor of the Consolidated Gas Electric Light and Power Company of Baltimore. Today, this progressive Company is serving 329,617 customers with approximately 2100 miles of mains, the majority of which are cast iron. A section of one of these mains, laid prior to 1830, is shown below (see cut).**

When you have customers with an unbroken record of buying your product for over a century, you naturally prize them. They're scarce in any long-established business or industry. The cast iron pressure pipe industry is proud to have 60 such customers—utilities that have been buying cast iron pipe for gas or water mains for 100 years or more.

Today's *modernized* cast iron pipe—centrifugally cast and with standardized mechanical joints—is even more economical and efficient. The pipe is stronger, tougher, more uniform in quality. The mechanical joints are bottle-tight for usual gas pressures and for all types of gas.

Cast Iron Pipe Research Association, Thos. F. Wolfe, Managing Director, 122 So. Michigan Avenue, Chicago 3, Ill.

This 10-inch cast iron gas main was laid in Baltimore over 120 years ago and is still serving. It is America's oldest functioning gas main.

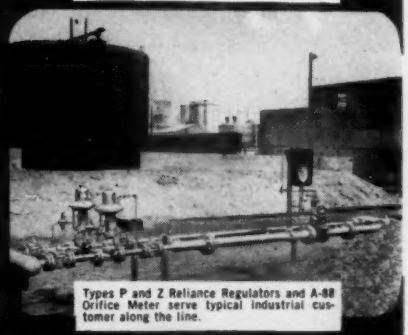
CAST Q IRON

The Q-Check stencilled on pipe is the Registered Service Mark of the Cast Iron Pipe Research Association.

**pipe FOR MODERN GAS DISTRIBUTION**

SCENES ALONG THE 3-STATE COMPANY ROUTE SERVED 100% BY AMERICAN EQUIPMENT

Type P and Type Z Reliance Regulators, plus 100" and 10" A-88 Integrating Orifice Meters at Henderson, Nevada Border Station. Working pressures average 420 psi and 27,000,000 cu. ft. daily capacity.



Types P and Z Reliance Regulators and A-88 Orifice Meter serve typical industrial customer along the line.

Close-up view of Dual Integrating meters and manifold needle valves at another user's plant. Meters are 100" and 10", connected in duplex.

American Temperature Recorder, plus pair of Integrating Orifice Meters serving another heavy industry along the lines of the Company.

Room for expansion . . . station at Las Vegas end of line showing provision for further piping plus American equipment.

# NEVADA NATURAL GAS PIPE LINE COMPANY 100% AMERICAN® EQUIPPED

**Spanning 117 miles of desert terrain, crossing the Colorado River en route, the lines of Nevada Gas Pipe Line Company reach from Topock, Arizona to Whitney, Nevada. Every foot of the line as it spans parts of three states is served by American measurement and regulation equipment. And ultimate consumers, both industrial and residential, are served by American Meters as well.**

**American Meter Company is proud of the part it has played in this $2,000,000 plus development that brings better natural gas service to a fast-growing industrial and residential area. Here—as in many similar projects across the country—American equipment brings dependability, accuracy and safety to gas suppliers and customers, just as it has done for nearly 120 years.**

AMERICAN METER COMPANY

GENERAL SALES OFFICE, 1513 Race Street, Philadelphia · Albany · Alhambra · Atlanta · Baltimore · Birmingham · Boston · Chicago · Dallas · Denver · Erie · Houston · Kansas City · Los Angeles · Minneapolis · New York · Omaha · Pittsburgh · San Francisco · Seattle · Tulsa

IN CANADA: Canadian Meter Company, Limited, Hamilton · Edmonton · Calgary

## ● NO DOWN-TIME FOR SCURFING

Even with Bunker 'C' oil, Semet-Solvay's Reverse Flow Process* eliminates mechanical scurfing, because *carbon is completely burned in the regular cycle.* No interrupted production . . . you have a clean machine at all times.

## ● MORE GAS FROM YOUR OIL

Because you get extended gas residence time with Semet's exclusive down-flow gas action, your feed oil is cracked more fully. You get greater recovery of the Btu's . . . you get more gas from the same amounts of feed oil.

## ● FLEXIBILITY OF ANALYSES

Semet's reverse flow operation assures better fixing due to accurate temperature control and complete cracking of the feed oil. Since your product has greater stability, it is no problem to produce gases to meet specific send-out requirements.

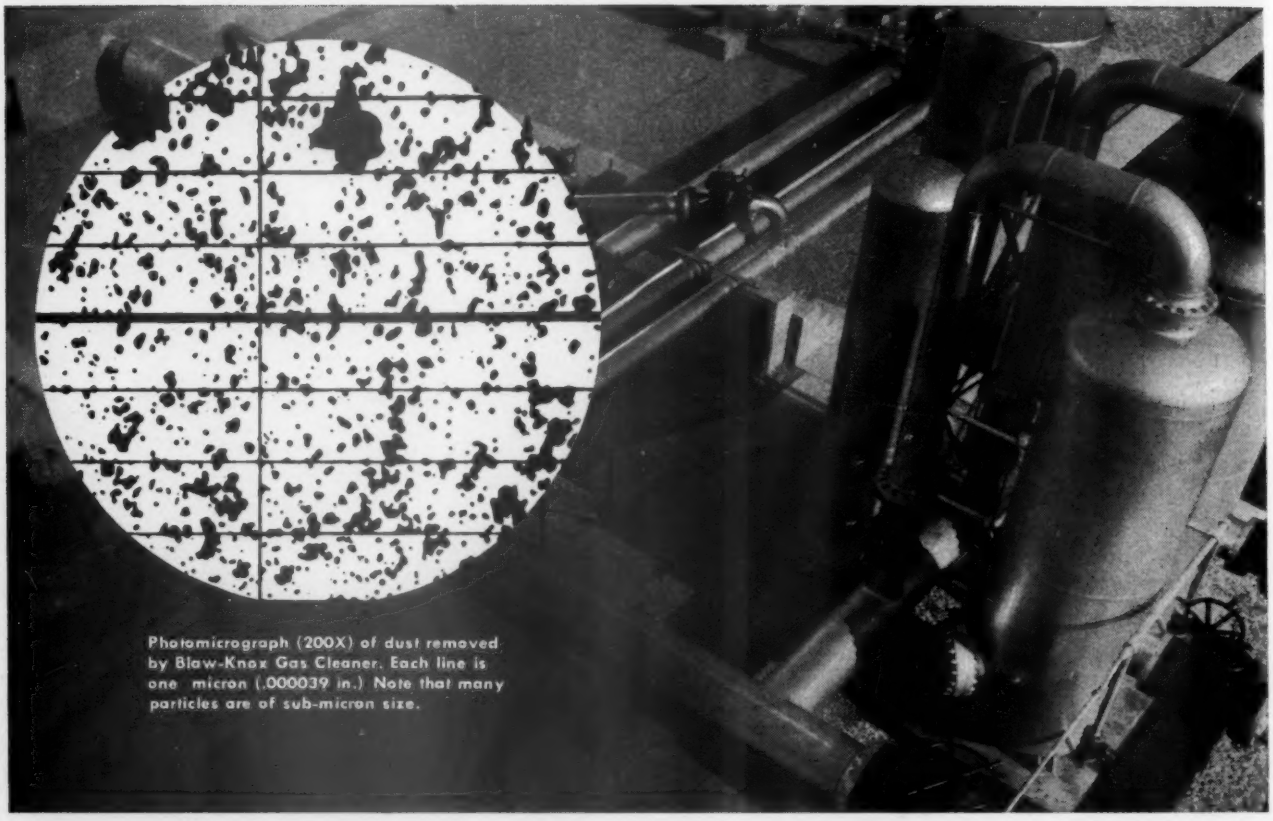
The reverse flow principle is exclusive with Semet-Solvay. It is the only *really* efficient process for stand-by and peak shaving.

Let us tell you how it will work for you.

*U.S. Pat. No. 2,605,176 and No. 2,605,177

SEMET-SOLVAY ENGINEERING DIVISION
ALLIED CHEMICAL & DYE CORPORATION
[illegible] Broadway, New York, N.Y.

Allied Chemical



Photomicrograph (200X) of dust removed by Blaw-Knox Gas Cleaner. Each line is one micron (.000039 in.) Note that many particles are of sub-micron size.

*dust particles 20 microns and below travel easiest, farthest — do the most damage*

# Field tests prove Blaw-Knox Gas Cleaners remove even the smallest dust particles

The test of any gas cleaner's efficiency should be measured *not* in terms of the amount of dust collected, but in terms of the quantities entrained in the "clean" gas. The removal of a high percentage of large dust particles is a relatively easy task. However, it is the particle sizes of 20 microns and below that travel easiest, farthest and cause the most damage. Blaw-Knox Gas Cleaners remove even the smallest particles of these dusts.

A large number of field performance tests have been run to determine the dust removal capacity of Blaw-Knox Gas Cleaners. Inlet dust loadings ranged up to 547 pounds per million cubic feet of gas. Tests on the cleaner outlet showed absolutely no dust getting past.

The ability of Blaw-Knox Gas Cleaners to maintain such performance is due to an exclusive operating principle through which each tiny particle of dust is placed immediately in violent, intimate contact with oil. In the expansion separation stages, a major portion of dust-laden oil drops out of the gas stream. An oil-wet, multiple baffle, primary separator catches and agglomerates the remaining tiny wet particles. Finally the gas is scrubbed by an efficient, multiple vane mist extractor.

When you buy, be sure to specify Blaw-Knox, for when you place a Blaw-Knox Gas Cleaner on stream, you're sure to remove even the smallest particles of dust.

*Blaw-Knox Electroil and Portable Hot Oil Foggers provide a safe, compact, efficient means of producing a stable oil fog in your gas streams.*

**A STABLE OIL FOG IN YOUR GAS MAINS:**

**Will wet down existing dust deposits.**

**Will prevent drying out and eventual dislodging of existing wet deposits.**

**Will moisten leather diaphragms.**

**Will curb internal corrosion of steel mains.**

**Will prevent loss of odorant by reaction with pipe scale.**

**Will help to prevent drying out of jute-joint packing.**

BLAW-KNOX

**BLAW-KNOX COMPANY**

*Blaw-Knox Equipment Division*
*Gas Equipment Department*
*Pittsburgh 38, Pennsylvania*

# Editorial:

## Check That Script!

RIGHT about now, men and women throughout the gas industry are at the point where their addresses and technical presentations for delivery at the annual convention of American Gas Association are ready for packing.

Even at the risk of seeming to be a long-haired journalist, we shall observe from experience that there is no better time to make valuable changes: additions, deletions and emphasis. Ask any hard-working writer, promotion or advertising man. After self-imposed revisions and qualified criticisms to the point of apparent perfection and completion—then, omissions come to light, obvious old hay comes out and emphasis is changed.

We're not thinking about the dull mechanics of words, periods, commas and grammar—never could understand the rules about prepositions, infinitives and such like. Content—that's the thing.

What will be the overall content of the addresses at the AGA convention?

Certainly, gas industry accomplishment should be brought out, with appropriate emphasis and pride. Frankness might, however, cause the insertion of last-minute indications of dissatisfaction with the extent of accomplishment, specific needs and methods for future acceleration.

Also, frankness might well bring about changes in emphasis on such matters as relationships of pipelines and utilities . . . adequacy of gas industry technical research, compared with all-industry research.

Competition should and will be recognized in terms and tones that are dedicated, sincere and convincing. Last-minute looks at scripts could inspire clear statements on what *really* is happening to the gas industry and the consequences.

Two-way cooperation—utility-to-appliance manufacturer and appliance manufacturer-to-utility—that's a possibility for emphatic additions reflecting substantial soul-searching.

Last-minute looks at convention scripts won't be worth the time required if changes are on paper only. Industry-realism, frankness and practicability should be checked out exhaustively.

## In Executive Session

ADVANCE notes on the program for American Gas Association's convention include an executive session on October 11, at noon.

"Only Company member delegates are eligible to attend," according to the program. Assuming a proper interest in association-affairs, that meeting should have the largest attendance of all meetings for top-level gas industry executives.

Two items of business make up the advance agenda for that session: election of directors, election of general nominating committee. There is no reflection, and certainly none is implied, in stating that order of business will not take up much time. The convention program for the remainder of the afternoon is of prime interest to technicians in the operating, accounting and residential sections.

Another item is suggested, most respectfully, to the industry's top executives for their once-a-year, closed-door session. Bull Session might well be the title; informality should be its character; frankness should be its essential requirement.

One subject is, with equal respect, suggested: What *really* is happening to the gas industry. Questions that come to mind: The eventual consequences? Industry policies and actions?

Wesley McCarlson

# 20,000-Meter Changeout Packaged Deal for South Atlantic Gas Co

## Economics and public relations figured large in Savannah decision

AN alert South Atlantic Gas Company has come up with another new one.

On August 7, American Meter Company, in collaboration with Shriver Gas Conversions, Inc., completed a 60-day installation of nearly 20,000 new, larger and modern meters to conclude South Atlantic's conversion of the Savannah division to natural gas.

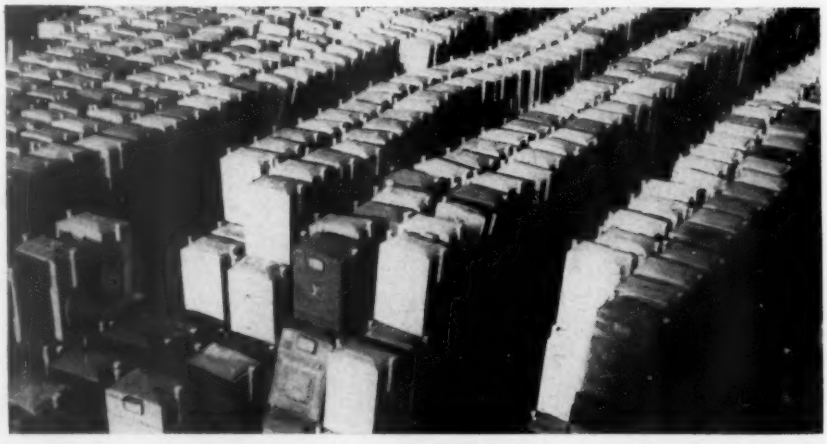
Meter company officials point to this as the first 100% changeout and, with the conversion firm, are sure it is the first "one package" deal—meters delivered, installed and accounted for—in the history of the gas industry.

The most interesting thing, however, is that management, through President H. Hansell Hillyer, advises that it made a 10-year study and forecast of certain important phases, in which the help of Arthur Andersen & Co. and Ebasco Engineers was secured. The results of this study show that, over the 10-year period, the over-all cost will be no greater than the more orthodox method of rebuilding existing meters. The months and years of worsened public relations usually following introduction of the hotter and dryer natural gas are believed to have been almost, if not completely, escaped by South Atlantic in this unusual Savannah operation.

H. Hansell Hillyer

Among the many factors considered by South Atlantic before the complete meter changeout was decided upon were tax savings on write-off of retired equipment and reduced shop expenses in future years. Also important was the fact that the "one package" deal with new meters delivered, installed, tested and actually recorded by the vendor's workmen on company cards was for a lump sum per meter. This procedure was made possible through joint efforts of American Meter Company and Shriver Gas Conversions, Inc. so that the entire $425,000 investment was properly classified as "new capital."

AMERICAN Gas Journal FEATURE



JUNKED!

With the contract for the purchase and installation of the meters signed, South Atlantic officials then realized another problem must be settled—that of customer public relations. How would customers react to a complete changeout of meters? Not one had been told of the contemplated changeout. How would a customer feel when suddenly a gas company man appeared at the door with a new meter? Why was the changeout necessary? Was something wrong with the old meter?

After careful consideration South Atlantic decided it was best to give its almost 20,000 customers the complete story. Initially, news releases would be made to the two local newspapers and this would be followed by a personal letter to each customer.

The news releases explained that the new meters would be especially adapted for the new natural gas and would be of a larger capacity in anticipation of greater consumption due to the increased use of natural gas for heating. The releases also declared that the meter changeout would be made at no inconvenience to the consumer. If a consumer was not at home, additional calls would be made until the changeout could be completed.

The letter to customers went out over the personal signature of C. B. Reinschmidt, vice president and Savannah Division manager. It was self-explanatory:

*Dear Gas Customer:*

*We must trouble you again.*

*In keeping with our continuing improvement program and the increasing demand for efficient, economical natural gas, we will start next week to standardize all gas meters in the residential areas. All present meters will be replaced with new, large capacity meters of the latest approved design. This will permit house heating and other increased usage of natural gas without special individual meter changes in the future. Work will start on June 7th and the complete program is expected to take about 60 days. Of course, there will be no charge for this change.*

*We want to thank you in advance for your usual fine cooperation and assistance to our men who will visit your home shortly to make this new installation.*

South Atlantic also took into consideration the customer whose old meter now suddenly dried out had ceased to register (there were more than 800 of them) or ceased to record fully the gas consumed. Such a customer would perhaps be the first to lodge a complaint since his new bill, showing the full amount of gas used would be higher than the old bill he had been receiving while the old meter was either failing completely to record or showing a lesser amount than the gas consumed.

Every old meter removed from a location and found to be inaccurate was recorded in the company's customer files. Such information was part of the 3-way card filled out by workmen when the changeout took place.

Before these customers were billed this letter was forwarded to each over the signature of office manager, Henry Rabey.

*Dear Customer:*

*We hope by now you are fully enjoying the benefits of the newer and hotter and cleaner natural gas; we hope also*

Turn to page 34—20,000 METERS

# How INGAA Publicizes Gas Industry

**IN THIS, the first of a series of exclusive interviews with gas industry executives on public relations, W. E. Wilson speaks for Independent Natural Gas Asscoiation of America. He emphasizes his opinions of the current regulatory extension to the producing end of the natural gas industry and clarifies the extent and availability of INGAA public relations program material. Mr. Wilson, above, is chairman of the INGAA public information advisory committee and director of public relations, United Gas Pipe Line Corp. Interviews relating to other gas industry groups and companies will appear in succeeding issues of the Gas Journal.**

JOURNAL: Mr. Wilson, as chairman of the public information advisory committee of Independent Natural Gas Association of America, would you tell us something about the Association—who the members are and what is stands for?

WILSON: INGAA was organized in 1944 by members of the various segments of the natural gas industry—producers, royalty owners, pipelines and distributors—and their purposes are reflected in the current public information program that we're going to discuss.

JOURNAL: That program was organized in 1953—March, wasn't it? How does it operate?

WILSON: March is right. And not too many months later it was operating as planned—on a small scale then. One important feature of our information program is the way it is controlled. Coordinated direction from all 3 segments of the industry provides ample insurance against the program deviating from its objective. An advisory committee establishes general policies and a subcommittee approves all copy and other materials. This subcommittee is made up of members from the 3 industry segments and sees to it that each segment is well-represented in the materials we produce.

JOURNAL: What sort of a program did your committee plan, Mr. Wilson?

WILSON: We planned a coordinated, industry-wide information program to tell the public—the growing millions of people who now use natural gas or have it available in their communities—the story of natural gas from the well to the consumer's burner tip.

JOURNAL: Why did INGAA undertake the program?

WILSON: As you know, the gas industry's growth has been phenomenal in the past decade. Only 16 years ago, natural gas was supplying less than 12% of the Nation's fuel needs—today, our industry fills almost ¼ of the energy requirements. Until fairly recently, the 3 segments of the gas industry have been so busy meeting the growing demands for gas that they have been more or less unaware of each other's problems. And as the industry has grown, its problems, too, have increased and magnified. The public, too, has learned very little about those problems.

JOURNAL: In your estimation, Mr. Wilson, what is the overall goal of the industry?

WILSON: To give more and better service to more and more customers. The natural gas consumer is the key man in our business. All of us in the gas business must keep in mind constantly the fact that only what is good for the consumer is good for us. That means service and supply. Dependable gas service, day and night, year after year, with reserves of gas to meet the constantly-growing demand. Anything the producer, pipeliner or distributor can do to insure such continuing service benefits all of us, including the consumer, of course.

JOURNAL: And where does INGAA come in?

WILSON: INGAA designed its public information program to tell the consumer—and the general public—about the tremendous investment, manpower and risks required of the industry in meeting the increasing demands for natural gas. We believe that, in order to provide the best possible service, the consumer must know our problems and how they affect him, so he in turn can help us meet them. INGAA's information program is based on the principle that it is better to provide adequate supplies of gas at competitive rates than inadequate supplies at "bargain" prices—and with all interdependent groups of the industry working together to get that job done.

JOURNAL: How do you tell that story?

WILSON: By working with local companies to tell an all-industry story. INGAA produces public information materials for adaptation to local use. These include advertising, a speakers' kit, spot radio commercials, feature stories about the industry, some for use in local newspapers and others for use in employee magazines, and an illustrated gas industry quiz for employee magazines. In addition, we are planning TV film spots and other materials for local company use. Every item tells how it takes joint 'round-the-clock work of producers, pipeliners and distributors to provide dependable, economical gas service.

JOURNAL: Are the materials designed for use throughout the industry?

WILSON: When we were planning the program, we realized the impossibility of producing a single package of materials to meet the needs of the 3 industry segments, so we decided to prepare separate series of ads, radio commercials and speech material adapted to the special needs of the companies using them. One series is for use by producers and pipeline companies; the other for local distributors.

JOURNAL: What subjects do you cover?

WILSON: We started by telling the story of exploration and development, emphasizing its importance to gas consumers. Then we moved into the transmission and distribution phases of the business. Both the copy and illustration themes support the industry's base-load-building program and reflect the national themes of American Gas Association, plus pointing out the relationship of exploration and production, transmission and distribution. INGAA's transmission materials describe construction, maintenance and operation of pipelines.

JOURNAL: How are the materials distributed?

WILSON: INGAA materials are available to any interested company, whether an INGAA member or not. Most material is free, although advertising mats or electros are sold at cost—which is low. Our program was designed to work through local companies to tell the story of the natural gas business on a community-by-community basis on a nation-wide scale. We hope that our "grass roots" program will spread to every part of the country.

## Available to all

JOURNAL: Well, how far *has* it spread?

WILSON: Now, we send information materials to 101 gas companies and state and regional gas trade organizations in 30 states and Canada. Many of those companies operate in several states, so their territories are fairly large. I'm sorry to say that we do not always know just how or where the information materials are being used, although many companies are kind enough to send us copies of INGAA ads they have placed. And I'm pleased to report that new companies are being added to the list of users of INGAA advertising and information materials regularly. We hope many others will take advantage of this service by writing to John A. Fergu-

Turn to page 33—INGAA

AMERICAN Gas Journal FEATURE

# *Our Age of Illusions*

*by* **T. T. Arden**
President-elect
Gas Appliance Manufacturers Association
*and*
Executive vice president
Robertshaw-Fulton Controls Company

T. T. Arden, the author, center, seen during the annual meeting of Gas Appliance Manufacturers Association. W. F. Rockwell Jr., president, Rockwell Manufacturing Co., is at the left and Sheldon Coleman, outgoing GAMA president, and president of The Coleman Co., is at the right.

HISTORY will probably call this the Age of the Great Illusions not only in world politics but also in the gas industry.

The dictionary defines an illusion as "something that deceives by producing a false impression." We've had the Nazi superman illusion; the Communist materialistic heaven illusion is still with us.

Those illusions, fortunately, are foreign, but unfortunately we're not without our own American brand.

Our two homespun variety illusions are "we can get something for nothing," and "let's get rich quick." They're responsible for a whole host of others like:

1. The atomic age for the housewife is just around the corner of the kitchen and the gas industry is doomed.
2. Federal power is so much cheaper the gas industry can't compete with it.
3. The future of the gas industry depends on continued government financing of private enterprise to prime the economic pump.

Atomic fission unquestionably is one of the great physical phenomena of human history. There is little or no question that atom powered ocean liners, warships, airlines and trains will follow the atomic submarine. Atomic power as a substitute for gas is another matter.

The government today is paying $200 a ton for uranium oxide ore which assays 0.02%. Processing costs in atomic energy production are tremendous. Gas needs no such costly processing and conversion.

Atomic piles are expensive, requiring extraordinary shielding, and so is machinery motivated by the atom.

Natural gas can be stored in the ground, including the pipeline through which it travels, and used in relatively inexpensive appliances which last many families a generation.

Natural gas is so ideal that a visitor from Mars who was hearing about it for the first time literally would regard it as the fuel of the future. It's economical, clean, noiseless, efficient, and safe. It is, in fact, the fuel of tomorrow, which we're lucky enough to be using today.

The Great Illusion of economy of Federal power has been with us for too-many years. There is no need to enumerate some of its high-placed prophets whom the voters fortunately have persuaded to quit the Washington scene.

The basic public power fallacy is the witting-or-unwitting oversight of hidden costs which always make comparisons of public competition with private enterprise so deceptive.

Private utilities paid over $1¼-billion in Federal and local taxes during fiscal 1952. Federal power projects paid none except for a trifling $5-million to state and local governments. Federal Power Commission says that 288 private utilities paid the government 22.3% of all revenue for income taxes. Public utilities paid none. A Federal excise tax is levied on all bills sent customers of all private utilities. Customers of public utilities pay none.

Taxes considered, Pacific Gas & Electric Company, to name but one, produced and delivered electric power to its customers at a lower rate in 1953 than did the publicly owned Los Angeles system or than the Tennessee Valley Authority produced and delivered through its cooperatives. Tax-free, PG&E could have sold power at 1.28¢ per kwh in 1953, instead of 1.71¢.

The public power fallacy is perpetuated by another oversight. All funds spent on private utilities are raised by private capital and amortized in rates to the consumer. Public utilities grow on funds borrowed against the future of the people at low interest rates. The load of financing public power projects of strictly local benefit is placed unfairly on the nation as a whole.

The most fallacious of all arguments is that public power safeguards the consumer against excessive rates. Rates of all private utilities are regulated by state or national commissions, with full power to protect the consumer.

The prophets of public power would have us believe that power in the hands of the government becomes a Stradivarius pouring forth only golden melodies, whereas in the hands of private industry power is only a lowly raucous bazooka emitting grunts and wheezes.

The third Great Illusion, that government subsidy is essential for healthy gas industry markets, is being exploded by the FHA scandals.

The inevitable result of subsidy is artificial value.

In one of our western states, a leading national agricultural show is backed with state funds. Despite great ballyhoo, it hardly draws enough crowds to make the effort worth while. In Los Angeles county, we have a Fair which is billed the world's largest and draws over a million people. The difference is it doesn't get any subsidy and is operated like a private enterprise.

Every consumer who has purchased a government-financed home—no matter how honorable the motive that inspired the system or how noble the motive of the man who wishes to provide a roof over the head of his family—has bought something of artificial value. In time to come he may find it to be ⅓ water. That ⅓, he'll find has been paid out to the man who made the windfall profits and others along the line who, with free funds to spend, spent them too freely.

The man who in the end will have to pay for these illusions is the consumer. And the consumer is every man, woman and child in the U.S.A., including the individual gas utility man and the individuals in appliance-and-equipment manufacturing firms. The consumer is our customer. We owe him protection from himself for our own selfish reasons if for no other. Call it enlightened selfishness if you will, but if we don't help encourage consumer buying power, we'll have no one to trade with.

A Great Illusion can be met and defeated only by a Great Reality: You work for what you get in this world, whether it's with the head or the hands, and you get rich or secure and solvent through thrift, initiative and ingenuity.

That is the way of free and intelligent enterprise, whether it's travelled by the manufacturer or the worker.

American Gas Journal FEATURE

# Drying processes in industry

A GREAT number of drying operations in industry, now being accomplished by mediums other than gas, can readily be adapted to gas. Most of them can be done more efficiently with gas.

This list of industries that have drying operations is intended to guide the industrial sales engineers of gas utilities to prospects in their territories:

Abrasives
Agriculture
Aircraft
Appliance
Art
Asphalt paving
Automotive
Bedding
Beverage
Bottle caps, closures
Building materials
Business machines
Cabinets
Candy
Cans
Cement
Ceramics, pottery
Chemical
Chewing gum
Cigars, cigarettes
Cleaning, fabrics
Clocks, watches
Clothing
Communications
Cork products
Cosmetics
Dairy
Electrical
Fertilizer
Film
Food
Foundry
Fuel
Fur
Furniture
Glass
Hardware
Laundry
Lumber
Meat packing
Metals
Munitions
Paint
Paper, pulp
Pharmaceutical
Plastic
Printing
Railroad
Rubber
Shoe
Soap
Stone
Textile
Tobacco
Wood

**Current INDUSTRIAL GAS SALES Topic**

**This is a condensation of an information letter prepared for American Gas Association, by William V. Bell, Metropolitan Utilities District, Omaha, Nebr. For details, communicate with AGA Industrial and Commercial Gas Section. Reference: Letter No. 65.**

# Corrosion control instruments

THE corrosion process on buried or submerged metals is closely associated with electric current flow and the investigation and solution of corrosion problems on subsurface metallic structures involves the measurement of voltages and currents at various locations on the structure, or near the structure in the surrounding electrolyte. The use of electrical instruments of various kinds is necessary before the corrosion problem can be solved. It is important that the engineer be familiar with their characteristics.

Although currents involved in the corrosion process, with their associated voltages, are usually of comparatively small magnitude, these currents are vicious with respect to deterioration of subsurface structure and the control of these currents involves electrical measurements of small magnitude which must be accurately made.

It is the purpose of this presentation to assemble a list of field instruments and meters that are particularly adaptable to use by the corrosion engineer. The presentation includes, also, names of manufacturers, distributors and approximate prices.

The instruments used in corrosion control are:

ammeters
combination meters
earth current meters
earth resistivity meters
flange testers
holiday detectors
interrupters
pipe locators
potentiometer-voltmeters
recording meters
vacuum tube voltmeters
volt-ammeters
voltmeters

**Current CORROSION Topic**

**This is a condensation of a presentation by Francis W. Ringer, consulting engineer, Narberth, Pa., at American Gas Association's distribution, motor vehicles and corrosion conference. For details, communicate with AGA Operating Section. Reference: DMC-54-11.**

# Selecting service supervisors

DESIRABLE qualities in supervisors are: honesty, know-how, diplomacy, dependability, emotional stability, natural leadership, initiative, follow-through, etc. Most potential supervisors have not attained all the qualities to the same extent.

Just after World War II our service group was reorganized and the changes included expanding our training unit, setting it up on the same level as operating sections, providing a line of progression for supervisors and a line for servicemen.

This training unit was expanded in formal recognition of the value of educating all personnel and to provide for development of all-appliance servicemen.

The line of progression for service personnel started with the helper and went through the various grades of meter and appliance work including emergency work.

By the time a serviceman reached the top level of this line he was substantially ready for supervisory work, practical knowledge considered.

It was our desire to provide an incentive for men to advance and an assurance that such advancement would depend entirely upon their own abilities.

With these aspirations we started to apply proper methods to obtain our aim.

When a supervisory opening is anticipated, a notice is posted, stating the position to be filled and the date by which applications must be submitted. The union is notified; as our labor contract gives them the right to recommend employees.

All personnel records are made available to a committee of supervisors who review the applications. These records cover age, length of service, attendance, sick absences, accidents and absence due to accidents, formal education, company-sponsored courses, previous employment, service with the armed forces and rank.

This committee is made up of supervisors of the Service Section to which the applicant is assigned but does not include top supervision of the section. The Committee considers these points:

Ability to handle men.
Experience in meter and piping work.
Experience in servicing appliances.
Administrative ability—preparation of reports.
Personality and appearance.
Customer relations—handling of customers.
Attitude, initiative, follow-through, dependability.

Under each heading, individuals are rated as E—excellent; VG—very good; G—good; F—fair. Values can be assigned, as E = 95, VG = 90, G = 85, F = 75 and a point score obtained.

When the committee has completed its ratings, they are passed to the department committee, comprised of section supervisors, assistant manager and manager of the department.

The department committee reviews each applicant just as the first committee did.

The actual mechanics of selection at this stage can be illustrated by a hypothetical case.

Assume that there are 20 applicants. The maximum point score that can be ob-

**Current MANAGEMENT Topic**

tained is 760. The first review of the lower committee's evaluation shows 10 applicants with less than 700 points. This reduces to 10 the number remaining to be considered. Two men have a score of 760, 2 have 755, 2 have 750, 1 has 740, 1 has 730, and 2 have 720. Starting with the lowest 2, each rating is reviewed and if unchanged the applicant is dropped. The review becomes more rigid as the group approaches consideration of the final 2. Here the change of 1 grade raises the applicant to the next group. The reviews had been based upon opinion of the man's ability under each heading. Now each man is compared with the others and is found to be the same, a little better or not as good. Formal schooling, recommendations of other foremen, union's recommendation, attendance, bear heavily at this stage. The elimination is carried on to its final stage and the last man is selected. There have been times when 2 men were on the same level. In such instances, the section head is given his choice.

We do not necessarily select the second highest man to fill the next supervisory vacancy. Each time, we have reviewed the entire slate of applicants, new and old. There have been times when we have selected more than 1 man at a time, in which cases the top men have been taken.

This method of selection is rigid; it is not perfect, the committee must be trained also to be impartial.

After a man has been selected to be a supervisor, his section head notifies him. At the same time the union is notified, for upon promotion the man leaves the union.

The department head welcomes the new supervisor to the ranks of management and reviews with him the department's mission, aims and hopes. Stress is laid upon our wish to make him feel and act as a part of management.

The new supervisor goes to the Job Training Section. Men brought up from the ranks sometimes find that they are confronted with adjustments, new assignments and responsibilities. A period of orientation and training can do much to create confidence for these adjustments.

The period of training may cover several weeks and includes 22 subjects.

**This is a condensation of a presentation by W. H. Weber, The Brooklyn Union Gas Co., at American Gas Association's 1954 conference on distribution, motor vehicles and corrosion. For details, communicate with AGA Operating Section. Reference: DMC-54-18.**

# *Volume measurement—distribution*

**Current GAS METERING Topic**

IT is evident that even in the largest situations, only comparatively few customers require special metering.

Satisfactory metering of large loads is accomplished only if the arrangement is satisfactory to both customer and company.

The first gas company representative that comes into the picture is the industrial salesman. He is very important; if he does a good job, satisfactory metering is well on towards accomplishment. Unless he has had extensive training and experience he should consult with others who can help him. It is his duty to make a practical contract and also make sure that the customer's equipment is properly engineered with regard to safety, convenience and freedom from trouble. He has a hand in selecting the meter location and helps select the customer's regulators and controls, and coordinates them with the gas company's regulators and controls to avoid duplication and interference.

Many of these large loads are "interruptible" so a quick and easy arrangement should exist for changing to gas from some other fuel and vice versa. He even interests himself in the training of the force which operates the gas burning equipment.

Customers in situations where large volume metering is applicable are eager to have safe and satisfactory equipment and will provide money for it.

The engineer who designs the meter arrangement must have:

1. Available inlet pressure—max.
2. Available inlet pressure—min.
   (Both above pressures are after connection; estimated from limits of inlet pressure before connection.)
3. Allowable pressure at beginning of customer's system—max.
4. Allowable pressure at beginning of customer's system—min.
5. Rate of flow at Stp—max.
6. Rate of flow at Stp—min.
7. If gas is used on cyclic basis, timing and magnitude of variations in flow rate.

Customer and company should agree to Items 3 through 7 in writing.

Most large volume customers are supplied through iron-type diaphragm meters set in parallel. They have regular indexes if they operate at ordinary distribution pressure and usually, but not always have base pressure indexes if they operate with higher pressure. Some few indexes are base volume, which correct for temperature as well as pressure and are used when the gas temperature is out of line with "standard."

The next most prevalent type is the rotary meter equipped with indexes of the regular, the base pressure, or the base volume type and sometimes equipped with a chart.

When peak flow rate is as high as 1 MMcfh, gas is almost sure to be high pressure and the most practical measurement is by orifice meter. The orifice meter may have a single integrating index, the counter reading cubic feet for a set "static" pressure, a double integrating index the counter reading cubic feet even though the "static" pressure varies, or no index at all.

The cubic feet in this latter case are calculated from a chart which records the "static" and differential pressures. It is generally good policy to have the chart along with an index, rather than the index alone.

The principal reason for having a chart in addition to an index is to check on the index; but the chart serves another useful purpose and that is to show rate of flow.

Some advantages and disadvantages of the 3 types of meters used for large volume measurement are shown in the accompanying table.

Proper sizing is achieved when meters will measure accurately both *maximum* and *minimum* flow rate.

It is generally well understood that an installation must be able to function properly when the load is maximum. It is not so well understood that maximum load means the highest flow rate attained, which bears little relationship to the volume used in a month or a day or even an hour.

It is frequently misunderstood that an installation must be able to function properly when the load is a minimum. Here again the consideration is flow rate. As the rate of flow through *any* meter is decreased, a point will be reached when the accuracy falls off. Eventually the meter will stop registering entirely. Diaphragm type meters do the best job in registering small flows and will register satisfactorily down to 0.1% of its maximum capacity and in average condition will register satisfactorily to at least 1% of capacity.

A meter installation that is correctly

CHOICE OF LARGE-VOLUME METERS

| *Type* | *Optimum Range* | *Significant Features* |
|---|---|---|
| Diaphragm | Up to 30 Mcfh | 1. Usually most expensive.<br>2. Usually takes most space.<br>3. Setting relatively simple; almost any space can be used.<br>4. Registers small flow accurately; to less than 1% of capacity.<br>5. Least maintenance.<br>6. Can be changed for test, overhaul.<br>7. Can be given convincing accuracy test.<br>8. Least affected by pulsation, surging. |
| Rotary | 20 Mcfh and up, low pressure<br>20-to-350 Mcfh, high pressure | 1. Testing, maintenance usually on customer's premises.<br>2. Accuracy falls off below 10% of capacity.<br>3. Difficult to accuracy test. |
| Orifice | Over 300 Mcfh, high pressure only | 1. Frequent visits, operation and maintenance.<br>2. Accuracy falls off below 28% of capacity.<br>3. Pressure loss is high.<br>4. Meter trouble cannot shut off supply.<br>5. Frequent estimating of parts of bill. |

sized in 1954 will not necessarily be correctly sized forever after. Changes in gas use should be an item covered by reasonably frequent inspection.

The orifice meter is the most restricted in respect to range of rate of flow that it can take care of.

Its range can be increased by:

1. Changing orifice size
2. Dual range recorders
3. Multiple parallel runs with changeover device
4. Separate metering by diaphragm meter of customer's pilot gas

The principles embodied in Items 3 and 4 apply to installations other than the orifice type.

A word of warning about "expansion factor" in stretching orifice meter capacity by either (1) or (2) above. The expansion factor is determined for each physical setup by the ratio between differential pressure and static pressure. Static pressure is usually relatively low in the mains supplying gas to customers and if the differential range is stretched too far the expansion factor will vary so much that it may be necessary to apply different expansion factors as the flow varies. This can be done but it is hardly practical.

**This is a condensation of a presentation by Robert J. Ott, Philadelphia Gas Works, at American Gas Association's 1954 conference on distribution, motor vehicles and corrosion. For details, communicate with AGA Operating Section. Reference: DMC-54-9.**

# *Odorization research*

**Current GAS ODORIZATION Topic**

A STUDY of commercially-available odorants for natural gas developed specifications for an odor test room that is suitable for examining the properties of gas odorants and a precision instrument for dispensing micro-quantities of odorant into the test room.

Seven commercial odorants were evaluated to determine odor levels, obtain odor properties, and show why different concentrations of the various odorants were required to produce the same odor levels.

A procedural method has been developed for odor analysis which produces a description of those properties of an odorant considered pertinent to its effectiveness as a warning agent.

The odorants used in the study were BP Captan and Captan, Natural Gas Odorizing Co., Inc.; Alert 80, Calodorant and Calodorant C, Oronite Chemical Co.; Pentalarm and Pentalarm 1004, Sharples Chemicals, Inc.

**The details of the Study of Commercial Odorants for Natural Gas are presentel in the final report by Russell W. McKinley and Ann E. Larratt, Arthur D. Little, Inc. This is under American Gas Association's research project PF-7.**

# *Better street employees*

**Current EMPLOYEE RELATIONS Topic**

SELECTION, training and testing of employees presents a constant challenge to management to improve operations and the welfare of individual workers. The art of gas distribution is continually changing. Under increasing pressure of higher costs and heavier gas loads, construction and maintenance of gas distribution systems require more highly skilled manpower, trained in the efficient use of new mechanized tools. Increasing knowledge on the part of management of better human relations with all employees has revealed the importance the worker gives to adequate training.

There is considerable literature on training servicemen and on management development.

Many personnel departments of gas companies have experts who make a specialty of selecting the right employee for each job.

Selection is complicated by the question of whether employees start at the bottom of the ladder, or are street department men hired for jobs such as fitters, welders, leak locators, machine operators, without previous training and experience in lower class jobs.

It has been the policy of some companies to promote only from the lower grades, particularly where union agreements dictate. Of course the new applicant should be carefully checked for physical and mental condition. Rejection for physical condition may be influenced by the current labor market supply; potential later injuries, such as back failures, should be thoroughly explored by competent medical examinations.

Two types of street department employees may be selected, those who may never be expected to progress beyond certain levels and those who might qualify to fill higher classifications. Selection methods and psychological tests will be different for these 2 groups. Final acceptance is usually made after a probationary period.

When discussing training of street department employees, we are dealing with men in jobs requiring considerably different skills, and yet they are all engaged in the primary purpose of construction and maintenance of a gas distribution system. There is a vast amount of general gas knowledge which each must have in common. When higher classifications requiring specific skills, such as welding, are filled by men taken from lower grades, training must be given.

Many companies have thorough procedure manuals and instruction books which detail practically all normal construction and operation methods. Often training programs are built around procedure manuals. Free and open discussion by all might result in the improvement of some procedures. If no such manual exists prior to starting a formal program, the training subject matter could be used as a basis for writing construction and operating standards. It is very important that procedure manuals are kept up to date.

A training program for specific jobs might be based on descriptions of duties in the job classifications. Under this plan, there might be classes held particularly for pipe fitters, compressor operators, leak locators, or welders; sessions would be part of the "skills" training and given to selected groups.

For any street department training program to be successful, its constant objective must be to supplement, not replace, the instruction given by foremen and line supervisors. The foreman must necessarily carry the major burden of training, since he is in charge of the work being done by the men. Most foremen have come up through the ranks; they have shown qualities of responsible leadership and are capable of directing others. Street department work is becoming more and more specialized and the modern foreman may have to be put in charge of a crew performing only one particular kind of work, and he may not be qualified to be a foreman of other kinds of work.

A training program should begin with the foreman. It could be divided into three main parts: basic policy information, special skills, how to instruct others.

All foremen should be thoroughly familiar with basic company information and policy such as: organization, gas characteristics, public relations, safety, record keeping, procedure manuals, distribution system design, map reading, and the like. The foremen should be instructed in these fundamentals at regularly scheduled class meetings by company officials or departmental supervisors. Special skills should be reviewed by foremen in order to fit them for all kinds of street department work. As the art of gas distribution changes, old-line foremen must be kept up-to-date.

Perhaps the most important training that a foreman can get is to learn how to instruct others.

Five training needs required by every foreman may be listed briefly as:

1. *Knowledge of the work*—materials, tools, machines, operations, properties of gas, services, technical skill and utility information.
2. *Knowledge of responsibilities*—policies, agreements, rules, regulations, safety schedules, interdepartmental relationships.
3. *Skill in instructing*—shortening training time by breaking jobs into simple operations, making learner receptive, presenting instructions, trying out performance, following up results.
4. *Skill in leading*—increasing production by leading employees to work willingly, securing department morale and loyalty, and preventing labor dissatisfaction.
5. *Skill in planning*—improving production through planning, organizing, and controlling for quantity and quality.

These basic skills of management must

be acquired individually. Practice and experience in using them enable both new and experienced supervisors to recognize and solve daily problems promptly.

Training programs should be worked out well in advance of starting. There should be a written outline of the curriculum. Since street department work is of a mechanical nature, both inside and on the job demonstrations should be performed for subjects such as pipe fitting and welding. Certain types of instruction might be given by specialists obtained from outside the company. As suggested for foremen, all employees should be given instruction and training in basic policy, and special skills. Training in special skills should be given to groups qualified to perform such skills. Public relations are very important; each employee should be trained in dealing with customers and the public.

Safety should be emphasized in each step of training. Many plans have been described in available literature on how to reduce accident frequencies.

**This is a condensation of a presentation by Marvin F. Hall, Ebasco Services, Inc., and Charles G. Minich, Jr., Delaware Power & Light Co., at American Gas Association's 1954 conference on distribution, motor vehicles and corrosion. For details, communicate with AGA Operating Section. Reference: DMC-54-12.**

# *Small LP utility operations*

*Current* GAS DISTRIBUTION *Topic*

THE small manufactured gas utility, which changed to propane air gas, had to face a great many problems it did not anticipate when initial plans were made for the conversion. These new difficulties have made operation of small gas companies interesting and challenging.

The conversion greatly reduced the cost of operating the gas plant as anticipated, but the problems of high unaccounted-for losses, dust and pilot light troubles, main and service stoppages, pressure troubles, and a substantial increase in insurance rates made it look as if the benefits derived from lower operating cost were going to be more than offset by increased operating expenses of the distribution and service departments.

The difficulties experienced varied, depending on the methods used in producing gas before the conversion took place and the types of pipe existing in the networks of mains. Where screwed or welded joint pipe prevailed, little trouble was experienced in leakage. However, where calked-joint pipe existed, oakum or packing dried out, causing joints to leak.

Where coal gas had been manufactured, the greatest enemy was napthalene. It had accumulated in large quantities. Almost immediately upon contact with the new gas, it began the process of drying and moving through the systems as a great "dust storm." At first, the small particles had a tendency to clog appliance pilots. Soon, great amounts of dust were expelled through the main burners of appliances, causing a reddish flame. Later, when the "storm" increased, it began to collect at restricted points in the distribution systems. The first point affected was where the service tee connected to the main; dust collected until it closed the gas passage.

We were faced with a problem of digging up the streets at these points and in many cases destroying improved paving, which in itself, was costly.

In distribution systems, where water gas was the previous method of production, oils and tars were of greatest concern. Dust from drying was sufficient to cause endless hardship in keeping appliance pilots in operation. Pilot filters were the best solution and we were faced with the additional expense of installing them, especially where automatic appliances were connected.

Regardless of the type gas previously manufactured, the effect of the new gas on packings in bell and spigot joints was similar. It was necessary to dig up the mains at about every bell to install leak clamps.

Before digging up the streets to install leak clamps, we experimented with Carboseal and similar products at strategic points in the systems to try to replace the oils that had been removed from the packing. While this was successful, it was temporary and would have to be repeated periodically. Another experiment was hot oil "fogging." This did not prove practical, since the injection was made at the plant; by the time it had reached the third or fourth drip, it had dropped out of the gas.

In some locations, purging was done by connecting standpipes to the dead ends of mains. The pipe was about 20 F high to effect a better disbursement of the gas and dust before it settled. Good results were realized from this effort.

The general effect the new gas had on meters varied depending on the foreign substances prevailing in distribution systems, and in the meters themselves.

The effects varied directly with the percentage of condensing in the primary gas. In extreme cases where a large concentration of impurities was present, a secondary effect eventually occurred, due to the deterioration of the diaphragms, with resultant leaks caused by hardening diaphragms. When this condition is present, we have never seen any satisfactory solution except the removal of the old diaphragms and replacement with either new diaphragms or with new meters.

In the systems where primary gases have been clean and a minimum of impurities were present, even though distribution was low pressure, some companies have equalized their system without the necessity of changing their meter diaphragms, although these cases are in the minority.

In cases of systems which had a very wet, unstable primary condition, where impurities are prevalent, experience shows it will be necessary to replace all diaphragms.

When the financial benefits to be obtained were estimated from converting to propane air gas, it was not realized that the insurance rates would increase approximately 46 percent above those for the same coverage when operating a manufactured gas plant. This is a large increase, and from all indications there is a possibility of them going higher still. Some of the larger gas companies are self-insured, especially in the first brackets, which are the most expensive.

With the larger and more flexible production facilities of the propane air gas plant and the higher Btu content of the gas delivered to the mains, production, storage and distribution is no longer a problem. Many companies, instead of extending their efforts toward doing a sales job and improving their operations to enable them to keep their rates in a more competitive position, have priced themselves out of business by increasing their rates to such an extent that it becomes economical for customers to turn to other fuels.

In addition to reducing manufacturing costs and solving production problems, conversion enabled the utility to enter the bottled gas business with minimum capital investment. By utilizing the propane storage facilities, together with converting the abandoned plant buildings to cylinder filling and equipment storage rooms, they were in the bottled gas business and in a position to capitalize on the many opportunities a combination city and bottled gas service has to present.

**This is a condensation of a presentation by C. M. Swan, Pennsylvania Gas Management Co., at American Gas Association's 1954 conference on manufactured gas production. For details, communicate with AGA Operating Section. Reference: CEP-54-11.**

# *Legal problems seminar*

*Current* LEGAL *Topic*

CURRENT legal problems of the gas pipeline and distribution companies were analyzed and discussed by lawyers and executives at a 5-day symposium jointly sponsored by American Gas Association and Practicing Law Institute. More than 250 participants represented Federal and state commissions; legal counsel; production, transmission and distribution companies; accountants and industry associations.

About 40 experts presented lectures and guided panel discussions.

Space limitations prohibit publication of summaries of the wide range of subjects, including field supplies, contracts, conservation orders, certificates, allocations, transportation and underground storage. Competitive positions of the coal and railroads were discussed. Rate increases, methods of determining rate-of-return and financing problems also were included in the program.

**For details on the presentations at the joint American Gas Association-Practicing Law Institute symposium, communicate with B. A. McCandless, AGA, New York.**

# FEDERAL POWER COMMISSION

## TETCO seeks to retire natural gas from Little Inch; build new facilities

The Commission has accepted for filing the application of Texas Eastern Transmission Corp. proposing to retire part of its Little Inch pipeline system from natural gas service and to construct new facilities to enable it to continue to provide service as presently being rendered.

Texas Eastern plans to retire that portion located between Baytown, Tex., and Moundsville, W. Va., and to convert it to the transportation of petroleum products. Gas now being moved through the system would be transported by new facilities which the company proposes to build.

The proposed facilities, which have an estimated cost of $71,814,000, would include about 481 miles of pipeline, 86,900 hp in new compressor stations, and 36,020 additional horsepower at existing stations. The project would include a 382-mile line from Beaumont, Tex., to Kosciusko, Miss.

The portion of the Little Inch which would be retired to Kosciusko, Miss., and converted to the transportation of petroleum products includes about 1,168 miles of pipeline, 5 compressor stations, and part of the capacity at 16 other compressor stations. Texas Eastern said that the reconverted Little Inch line would be operated as a common carrier petroleum products pipeline pursuant to provisions of the Interstate Commerce Act and subject to jurisdiction of Interstate Commerce Commission.

Upon completion of the proposed facilities Texas Eastern's system will be in a position to transport to the East gas gathered from fields in the Southwest through either the Big Inch, the Texas Gas Transmission Corp. system, or Texas Eastern's proposed Kosciusko line, the company said.

## Colorado Interstate files proposed $10,269,000 rate increase

Colorado Interstate Gas Co. has filed a proposed $10,269,000 or 42% annual wholesale natural gas rate increase.

The proposed increase is over and above the $6,508,000 increase which the company is now collecting subject to refund. In its latest request, Colorado Interstate is asking a 6½% rate of return.

The new rates, which the company proposes to make effective September 1, would affect 12 wholesale customers in Colorado and Wyoming.

The company bases its rate increase request principally on the substitution of value for its gas in lieu of the actual cost of producing such gas. It also claims increases in the costs of purchased gas.

## Amends regulations of independent producers affected by Phillips case

The Commission has amended the regulations prescribed by Order 174 governing independent producers and gatherers of natural gas which, under the Supreme Court decision in the Phillips Petroleum Co. case, are subject to the Natural Gas Act and to regulation by FPC.

The amended regulations, in Order 174-A, make simplified applications available to those producers proposing to engage in transportation or sale of natural gas in interstate commerce, as well as to those already so operating on June 7th.

Where established or new service by an independent producer will call for interstate sales of less than 1,000,000 Mcf of natural gas in interstate commerce annually, an original and 5 copies of the abbreviated application are required. Those producers whose annual sales in the aggregate amount to a 1,000,000 Mcf, or more, annually must file a certificate application in only slightly greater detail, and are required to furnish 14 copies in addition to the original.

If the interstate operations were carried on at the time of the Supreme Court decision, June 7, 1954, the application must be filed by October 1, 1954, but if the service is proposed, the application must be filed and a certificate of public convenience and necessity issued prior to initiation of service.

Order 174-A eliminates the requirement for producers to make their filed rate schedules available during regular office hours and the requirement to file corporate articles of incorporation, corporate by-laws, and copies of authorizing directors' resolutions.

Since many smaller producers have pooled their operations and carry on group activities through a single operator, Order 174-A allows certificate applications to be filed by the agent of the group, with their approval.

## Authorize South Georgia Natl to build system serving Ga-Fla

A presiding examiner has filed a decision authorizing South Georgia Natural Gas Co. to construct and operate a 368.3-mile natural gas transmission system to serve new market areas in Georgia and Florida.

The authorized South Georgia transmission line will begin at a point of connection with the Southern Natural Gas Co. pipeline system in Lee County, Ala., and will extend to a point near Albany, Ga. From Albany, a branch will run via Valdosta, Ga., to Ellaville, Fla. A second subsidiary line will be built at a point near Moultrie, Ga., to extend to a terminus located near the Georgia-Florida border.

Estimated cost of the project is $8,969,429 which South Georgia proposes to finance through sale of first mortgage bonds and junior securities. Through its new system, the company will deliver natural gas for resale to 14 Georgia and Florida communities, and will make direct interruptible gas sales to 5 industrial customers.

## Authorize tariff revisions proposed by 7 Columbia System subsidiaries

The Commission has authorized proposed changes to take effect in the tariff provisions of 7 Columbia Gas System, Inc., subsidiaries to permit industrial firms to buy increased supplies of natural gas from the Columbia System.

Tariff revisions authorized apply to rate schedules of Manufacturers Light and Heat Co., Home Gas Co., Ohio Fuel Gas Co., Atlantic Seaboard Corp., United Fuel Gas Co., Amere Gas Utilities Co. and Central Kentucky Natural Gas Co., all of Charleston, W. Va.

Under the new provisions, the availability clauses in existing rate schedules are changed to permit direct purchasers and resale customers to buy up to 2 MMcf per day of natural gas for ultimate consumption as boiler fuel. Former limitations had placed a 500 Mcf per day ceiling on such sales.

Effect of the tariff changes, which are effective as of August 6, will be to increase Columbia System gas sales to industrial customers.

## Ohio Fuel seeks construction okay

The Ohio Fuel Gas Co. has filed an application with the Commission requesting authorization for construction of 9 projects consisting of 28 miles of pipeline and a 140-hp compressor unit.

The new facilities, estimated at $832,700, would parallel or replace sections of existing lines, and are designed to provide additional capacity to transport increased supplies of natural gas to market.

## Colo-Wyoming gas files rate increase

Colorado-Wyoming Gas Co. has filed a proposed $1,147,000 annual wholesale natural gas rate increase.

The proposed rates would result in a 35% annual increase over rates which FPC allowed to go into effect on a contingent basis last January 1. In that proceeding, the Commission accepted a $336,000 per year increase in substitution for the company's previously-proposed $432,500 increase.

Colorado-Wyoming proposes to make the increase effective on September 11. It would affect 4 wholesale customers in Wyoming and Colorado.

The company said that the primary reason for the higher rates was the increased cost of gas purchased from Colorado Interstate Gas Co. Colorado-Wyoming also is seeking a 6¾% rate of return.

## Trunkline gas asks for station okay

Trunkline Gas Co. has asked the Commission to authorize construction of a 6,350-hp compressor station on the company's transmission system in Texas.

The proposed station, at Edna, Tex., has an estimated construction cost of $1,563,800, and would contain just one compressor unit.

## Construction certificate to Pbgh Manufacturers Light and Heat

The Commission has authorized The Manufacturers Light and Heat Co., Pittsburgh, to construct and operate 61 miles of natural gas transmission line and 1,760 horsepower in compressor capacity, in 13 projects, on its system in Ohio, Pennsylvania and West Virginia.

# *Price Indexes of Gas, Other Fuels and Electricity*

GAS RATES were unchanged from May to June, in the index prepared and issued by U. S. Bureau of Labor Statistics. Thermal content changes in 4 cities resulted in lower average net monthly bills for heating and non-heating gas. In 3 cities, these changes resulted in slightly higher gas bills. The cost of residential space heating gas declined 0.2% and non-heating gas was down 0.1%—both from the May level.

ELECTRICITY RATES were unchanged. A fuel adjustment in the city of New York brought about a slight increase.

BITUMINOUS COAL PRICES were up in 3 cities and down in 3 other cities. The average for the 26 cities in the BLS survey is unchanged from May.

ANTHRACITE PRICES moved up in 3 of the 9 cities surveyed during June, with increases ranging from 5-to-60 cents per net ton.

FUEL OIL PRICES showed a drop of 0.3% in June from the May level.

Source: Bureau of Labor Statistics, U. S. Department of Labor (1947-1949 = 100.0)

| | 1954 | | | | | | 1953 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | June | May | Apr. | Mar. | Feb. | Jan. | Dec. | Nov. | Oct. | Sept. | Aug. | July | June | Jan. |
| GAS | | | | | | | | | | | | | | |
| Space heating | 114.3 | 114.5 | 114.1 | 113.9 | 113.7 | 113.6 | 113.6 | 113.5 | 112.8 | 112.4 | 112.5 | 111.2 | 111.2 | 108.9 |
| Non-space heating | 108.8 | 108.9 | 108.8 | 108.8 | 108.8 | 108.8 | 108.8 | 108.8 | 108.2 | 108.0 | 108.0 | 107.1 | 107.2 | 106.4 |
| Natural | | | | | | | | | | | | | | |
| 10 therms | 99.7 | 100.0 | 99.9 | 99.9 | 99.9 | 100.0 | 100.0 | 99.8 | 99.9 | 99.8 | 99.8 | 98.6 | 98.7 | 98.3 |
| 25 therms | 112.3 | 112.6 | 112.3 | 112.3 | 112.2 | 112.2 | 112.2 | 112.2 | 111.4 | 111.3 | 111.3 | 110.1 | 110.2 | 108.9 |
| Manufactured | | | | | | | | | | | | | | |
| 10 therms | 109.4 | 109.4 | 109.4 | 109.4 | 109.4 | 109.4 | 109.5 | 109.5 | 108.2 | 108.1 | 108.1 | 107.4 | 107.4 | 106.9 |
| 25 therms | 109.6 | 109.5 | 109.6 | 109.6 | 109.6 | 109.6 | 109.7 | 109.7 | 109.1 | 109.0 | 109.1 | 108.4 | 108.4 | 107.8 |
| Mixed | | | | | | | | | | | | | | |
| 10 therms | 96.4 | 96.4 | 96.4 | 96.4 | 96.4 | 96.4 | 96.4 | 96.4 | 96.4 | 96.0 | 96.0 | 96.2 | 96.2 | 96.2 |
| 25 therms | 100.4 | 100.4 | 100.4 | 100.4 | 100.4 | 100.4 | 100.4 | 100.4 | 100.4 | 99.9 | 99.9 | 100.0 | 100.0 | 100.0 |
| All types combined | | | | | | | | | | | | | | |
| 10 therms | 105.2 | 105.3 | 105.2 | 105.2 | 105.2 | 105.3 | 105.4 | 105.3 | 104.8 | 104.7 | 104.7 | 103.9 | 103.9 | 103.5 |
| 25 therms | 112.6 | 112.8 | 112.6 | 112.6 | 112.5 | 112.5 | 112.5 | 112.5 | 111.8 | 111.7 | 111.7 | 110.6 | 110.7 | 109.6 |
| ELECTRICITY | | | | | | | | | | | | | | |
| Composite | 104.5 | 104.5 | 104.5 | 104.5 | 104.4 | 103.8 | 103.8 | 104.2 | 104.2 | 104.1 | 104.1 | 104.0 | 104.1 | 104.4 |
| SOLID FUELS | | | | | | | | | | | | | | |
| Bituminous—All sizes combined | 117.2 | 117.2 | 119.5 | 120.6 | 120.6 | 120.7 | 120.6 | 120.4 | 120.2 | 119.5 | 118.3 | 118.0 | 117.3 | 119.8 |
| Anthracite—All sizes combined | 124.1 | 123.1 | 130.2 | 135.0 | 135.0 | 135.0 | 135.0 | 135.0 | 134.9 | 134.8 | 133.7 | 133.1 | 130.6 | 135.9 |
| PETROLEUM | | | | | | | | | | | | | | |
| Fuel oil No. 2 | 117.7 | 118.1 | 120.6 | 122.1 | 123.2 | 121.9 | 120.9 | 122.7 | 122.5 | 120.2 | 120.3 | 120.2 | 117.9 | 116.6 |

THE INDEX of retail prices of fuels and electricity, issued monthly by the Bureau of Labor Statistics, U. S. Department of Labor, considers specific consumption quantities of gas, 10 and 25 therms, representing typical usage by families represented in the Bureau's Consumer Price Index.

Monthly gas bills, net, are basis for computing the index. Data are collected in these cities:

NATURAL GAS: Atlanta, Baltimore, Cincinnati, Cleveland, Detroit, Houston, Kansas City, Los Angeles, Minneapolis, New York, Pittsburgh, St. Louis, San Francisco, Washington

MANUFACTURED GAS: Boston, New York, Portland, Ore., Scranton, Seattle

MIXED GAS: Chicago, Philadelphia

The index for electricity is based upon data collected in the same list of cities.

Anthracite prices are collected in 9 large and small cities; bituminous prices in 26 large and small cities; fuel oil No. 2 prices, from 11 cities.

The base period of the index is the average for the years 1947, 1948 and 1949. That average is referred to as "100.0."

Month-to-month net retail prices and applicable taxes are compared with the base, and computed to express, as an index number, any change from the base. While these indicators are numbers, they may be interpreted directly as percentages of change from the base period.

Examples: A current index number of 121.8 indicates a 21.8% increase from the base period; an index number of 96.4 indicates a decrease of 3.6% from the base period. This percentage comparison is applicable only from the current index to the base period.

Percentages of change from one index number to another comparable index number, other than the base (100.0), can be calculated: Subtract the older number from the new number, then divide the difference by the older number.

Examples: Older number is 115; newer number is 125; difference is 10. Divide 10 by 115; answer is 0.0869, or an 8.7% increase. Older number is 125; newer number is 115; difference is 10. Divide 10 by 125; answer is 0.080, or an 8.0% decrease.

# *Index of Yields: Selected Utilities Stocks*

Expressed as percentages

| | 1954 | | | | | | | | 1953 | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Aug. | July | June | May | Apr. | Mar. | Feb. | Jan. | Dec. | Nov. | Oct. | Sept. | Aug. | June | Jan. |
| Transmission companies | 4.17 | 4.25 | 4.04 | 4.08 | 4.15 | 4.17 | 4.25 | 4.21 | 4.39 | 4.44 | 4.44 | 4.90 | 4.46 | 4.72 | 4.04 |
| Transm. & distrib. companies | 4.67 | 4.88 | 5.01 | 5.01 | 5.11 | 5.27 | 5.39 | 5.39 | 5.54 | 5.49 | 5.58 | 5.74 | 5.13 | 5.55 | 5.02 |
| Manufactured & mixed companies | 4.26 | 4.36 | 4.45 | 4.46 | 4.67 | 4.68 | 4.66 | 4.66 | 4.91 | 4.75 | 4.94 | 5.14 | 4.99 | 5.08 | 4.87 |
| Class "A" electric companies | 4.31 | 4.31 | 4.60 | 4.64 | 4.70 | 4.68 | 4.92 | 4.92 | 5.10 | 5.15 | 5.14 | 5.41 | 5.27 | 5.53 | 5.08 |
| Class "B" electric companies | 4.70 | 4.78 | 4.83 | 4.94 | 4.94 | 4.93 | 5.01 | 5.14 | 5.23 | 5.14 | 5.37 | 5.61 | 5.50 | 5.68 | 5.19 |

This is a straight arithmetical index of comparative yields obtainable on a selected group of gas and electric utility industry common stocks.

The companies comprising this index have been selected by the AMERICAN GAS JOURNAL as providing a representative cross-section of each industry, from the standpoint of geographical diversification and of the relative importance of the individual companies in their areas.

No effort has been made to weight the average to give effect to changes in capitalization or in dividend rates because the yields afforded on the issues reflect such changes. The index is designed to show the rate of return and not necessarily market movements on the stocks comprising it.

This index is compiled from: natural gas transmission companies, 5; natural gas transmission and distribution companies, 5; manufactured and mixed gas companies, 4; class "A" electric companies, 4; class "B" electric companies, 5.

# Present Economy Relatively Stable But Future Expansion Is Seen

*By* **John F. Falvey**
**Financial Editor**

CAREFUL study of the economy prompts 2 conclusions. One is that while soft spots still are noticeable in some quarters, the overall picture currently is one of relative stability. The second conclusion, and one which reflects the belief of leading economists, is that the longer range future holds forth promise of much greater expansion of the economy. Since the beginning of last winter economic activity has held pretty much on an even keel, not far below the record high level reached in 1953. The usual fluctuations have been remarkably absent.

National output to date this year has stayed within 4% of last year's unprecedented volume and remains impressively large. Gross national product (the value of all goods and services produced) is running at a $256 billion annual rate. This is only $15 billion, or 4% below the 1953 peak and $26 billion—11%—above 1951.

Personal income of individuals has fluctuated a maximum of only $2 billion, a mere 7/10 of 1%, since last January and now is at a $286½ billion a year rate, at which level it is a full $2 billion above where it was last spring.

In the important field of construction the gains have been greater than anticipated, with the pace quickening in recent months. For the first 7 months of 1954 they reached a record $20.1 billion, with the month of July figure alone standing at $3,513,000,000, up $188 million, or 5.6%, over July 1953, and hitting the highest monthly total in history. Residential construction headed the gains.

New contract awards recently compiled indicate that construction will continue to be strong for some months to come. The construction gains already recorded, and in prospect, augur favorably for the trend of utility industry revenues, and they suggest, too, that expansion of plant to take care of increasing consumer demands will mean continued recourse to the security markets for the funds with which to finance this expansion.

Granting that the Federal Government does not upset the market again by marketing long term obligations of any substantial size, the expectation is held generally that the corporate bond market will either hold at current levels or go moderately higher over the next several months.

In all, the Government must raise $6 billion this fall or early winter. If it decides not to repeat its ill-fated step of the 1953 spring (when its marketing of a long term bond threw the corporate bond market into a sharp tail-spin) and tries to raise the needed amount of "new money" through sale of certificates to the banks, the favorable imbalance of available investment funds exceeding the amount of bonds available for purchase, should mean at least as favorable offering conditions for the utility companies during the closing months of 1954 as now exist.

While investments of the important life insurance companies in corporate bonds and stocks during the initial half of this year was 11% below the comparable year-earlier period, funds flowing into these institutions are increasing at a substantial rate and will have to find remunerative outlet. Conversely, the total of available investment media promises to contract somewhat over the early months ahead, with an estimated small increase in the volume of utility industry offerings unlikely to offset completely the contraction looked for in new industrial company marketings.

It is expected that new money offerings of bonds and stocks for the full year 1954 (exclusive of refundings) will be in the neighborhood of $6 billion, or about 20% below the $7.5 billion of 1953. With volume of offerings in the first half of this year aggregating about $3.5 billion, against $4.3 billion in the similar 1953 period, the second half volume probably will be about $500 million less than the total of the second half of 1953.

By the same token, the banks also find themselves with the problem of coping with the tremendous growth of time deposits. These have been setting new records by the month. In the past year and one-half they have grown by some $7 billion for all banks, during a period when demand deposits actually have been declining.

At the moment the large banks are endeavoring to stem this time deposit growth by cutting the interest rate on funds of the large depositors who are seeking both a high rate of interest and immediate liquidity.

Small savers also have been swelling their deposits in savings banks and in the savings or thrift departments of the commercial banks, with the rate of increase this year expected to set a new high record.

Despite the fact that institutional or long range investment buying has been a chief factor in the rise in common share prices, the savings banks in New York State, at least, have been slow in taking advantage of the legislative authority given them more than 2 years ago to buy common stocks. They are proceeding cautiously to say the least. The 69 banks which do their common stock investing jointly through a fund established for the purpose had purchased at last report only $10.2 million of common shares, or only a fraction of 1% of their total investments. This compared with the $14.4 billion which the entire group of 129 mutual savings banks throughout the state had on hand at last report.

From all indications, educating the banks on the merits of common stock investment promises to be a very long and equally tedious task.

Underlying the buoyancy of share prices has been the gradual improvement in the bond market and the strengthening of corporate financial resources.

The working off of inventories which was reflected in lower production in late 1953 and early 1954 is one of the principal factors contributing to the declining corporate need for new funds, for the first time in 5 years.

At this writing it appears that working capital resources of corporations at the forthcoming year-end will be about $2½ billion larger than at the end of 1953. Furthermore, the quick asset position in many instances is expected to improve, especially for those companies whose plant expansion needs have been largely filled and which are benefiting from accelerated amortization of new plant.

The net result should be continuing improvement in the ratio of net worth to outstanding debt.

Despite this improving outlook for industry in general and especially for the utility companies, whose expansion prospects are as undimmed as ever, caution against holding utility shares is being advised in some financial quarters.

By any standard, utility stocks are too high, these advisers say, and, in our opinion, entail market risks that are not justified by either present or prospective earnings and dividends or by possible further appreciation possibilities.

The strength in utilities this year has been due almost entirely to a higher capitalization of earnings and dividends resulting from the Government's easy money policy and the large amounts of institutional funds available for investment. Few investors, however, realize how far this process has gone and that stocks are not only at new absolute postwar highs but close to their highest levels in relation to earnings and dividends. It is true that in January 1946 yields were extremely low and utility shares were selling at a high ratio to earnings, but at that time both dividends and earnings reflected the heavy burden of 1945 excess profits taxes and were obviously headed for substantial increases. In fact, dividends in 1946 increased 8% while earnings were 27% larger than those reported for 1945. But even with these sharp increases, which certainly are not in prospect at the present time, the market could not maintain such high levels and in the fall of 1946 precipitously started a sharp decline.

Heavy buying by pension funds, life insurance companies, and other institutional investors has undoubtedly been largely responsible for the strength in utility stocks over the past year. However, it should be remembered that the administrators of these funds exercise the utmost care in their investment policies and that there is a limit

Turn to page 37—FALVEY

INDEX OF YIELDS:
SELECTED UTILITIES STOCKS
See bottom of facing page.

American Gas Journal FEATURE

# YOU GET THE "EXTRAS" IN SALES with JOHN WOOD

## Automatic *GAS* Water Heaters

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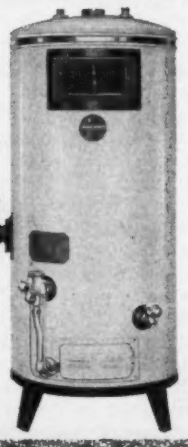

Dual-Action

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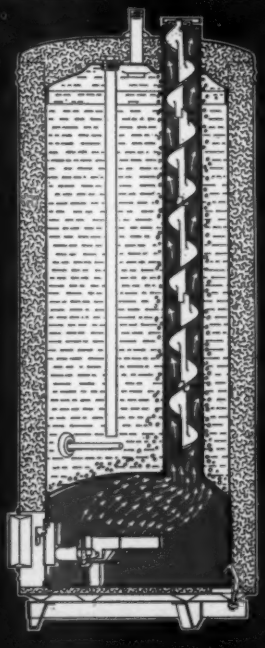

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Finest glass-lined or galvanized water heater anywhere!

# Old Days Recalled... from AMERICAN Gas Journal

ESTABLISHED 1859

## 90 YEARS AGO

**September 1864**

WHERE CONFEDERATES GET THEIR COAL. *There are extensive coal mines lying on both sides of the James River (Va.) a few miles above Richmond. The area of this coal field is about 20 miles deep with an average breadth of 5 miles. The coal is bituminous and it has been largely used for steam purposes and for the production of gas. These mines were probably the earliest worked of any in the United States, mention being made of them in the American Journal of Science of 1818, as having been in operation for 30 years previously.*

## 50 YEARS AGO

**September 1904**

THE WORCESTER GAS LIGHT COMPANY (Mass.) started business in 1849. The output for the first year was 7,000,000 cubic feet. In the last 12-month period the send-out was 450,000,000 cubic feet.

SEPTEMBER 1904

IT IS GRAVELY ANNOUNCED that the Grand Rapids (Mich.) Gas Light Company has determined to award "prizes of $1 each" for all suggestions made by employees that are adopted by the company. One dollar!

SEPTEMBER 1904

THAT PART OF THE ANNUAL REPORT of Mr. E. G. Runyan, Inspector of Gas and Gas meters for Washington, D. C., which has to do with meter testing, declares: "Nine hundred and three of the complaint meters were tested at the request of the Washington Gas Light Company and of this number; 21 were found correct; 10 were fast and had an average error of 4.26%; 562 were slow and had an average error of 24.24%; and 310 failed to register any of the gas passing through them."

SEPTEMBER 1904

THE PENNSYLVANIA RAILROAD COMPANY has discontinued its electric plant in Lambertville, N. J., and the lighting of its station, freight houses and offices will be done by the local gas men.

SEPTEMBER 1904

"THE PURIFYER" is the name of a letter sheet that is to be published once a month in San Francisco, the function of which is to promote the interests of the Pacific Coast Gas Association. So, after all, the association has an official organ.

## 25 YEARS AGO

**September 1929**

PATRICK J. MCINTYRE *retired from active work with The Brooklyn Union Gas Company September 1, after 55 years of continuous service. In 1874 Mr. McIntyre joined the staff of The Brooklyn Gas Light Company, which was merged with the present Brooklyn Union Gas Company, in 1895.*

SEPTEMBER 1929

ON AUGUST 15 NATURAL GAS *was blown into the pipes in the city of Evanston, Wyo. The test was successful and on August 20, "Gas Day" was observed with a general jollification and jubilation.*

SEPTEMBER 1929

JAMES T. HUTCHINGS, *Vice President of The United Gas Improvement Company in charge of engineering development, died suddenly on August 17, at Ocean City, N. J.*

SEPTEMBER 1929

"NATURAL GAS *is the Nation's priceless and irreplaceable natural resource" it was stated at the annual meeting of the Colorado Utilities Association. "Rapid growth of the use of gas in industry is shown by the fact that the average increase in gas sales per customer in the last 10 years has been 17.4% while for comparison the increase in the use of electricity in the same period has been 9.6%. . . . The average American home of a few years hence will be heated and cooled by gas the year 'round."*

SEPTEMBER 1929

THE DEATH OF CARL AUER VON WELSBACH [*August 4, 1929*] *not only deprives the gas industry of one of its outstanding geniuses but will also cause many of us to hark back to the time when the lighting fixture bearing his name was the mightiest bulwark in our entire business. Later this selfsame bulwark was to serve us faithfully during the trying period of transition when we came to find that our big field lay in the use of gas as a strictly heating agency. . . . Carl Auer von Welsbach in inventing the gas mantle accomplished several things of inestimable value to the industry . . . the mantle threw its vast potential possibilities into the breach of gas commercial matters at a time when most needed and heartened the industry until it could find its ultimate field in the realm of heating. . . . Although gas lighting, in this country at least, is but a shadow of its former greatness, Carl Auer has written his name imperishably in the scientific annals of the gas industry.*

SEPTEMBER 1929

NEGOTIATIONS WERE COMPLETED *on August 31, whereby The Stacey Engineering Company, a new Ohio corporation operating as a holding company, took over the following concerns; The Stacey Bros., Gas Construction Co., O., The Connersville Blower Co., Ind., and Wilbraham-Green Blower Co., Pa. All of the firms have for a long period engaged in the construction of gas holders, blowers and other apparatus used by gas.*

AMERICAN

## *Gas Fundamentals* OUTLINE

NATURAL GAS
- *Geology
- *Drilling and completion
- *Methods of estimating reserves
- *Chemicals from gas
- *Natural gas conservation
- *Underground storage of natural gas

MANUFACTURED GASES
- *Coke oven gas; producer gas, blue gas, carbureted water gas
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BASIC GAS LAWS
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TRANSMISSION
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CONVERSION PRACTICES

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- *Corporate structure
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- *Functions of the Land Department
- *Communications in the gas industry
- Personnel Management

GLOSSARY
- *Ab-to-Zon

***Chapters published since Jan. 1951.**

## How to Use the Material

American Gas Fundamentals *is a comprehensive compilation of basic gas facts to guide any gas utility employee toward a broader understanding of the industry as a whole.*

*The series is designed to be removed from each current issue of* AMERICAN GAS JOURNAL *and filed in a ring binder where it may be accumulated into a text book of permanent usefulness. Material should be filed under the major subject head appearing in the upper right hand box at the head of each chapter.*

AMERICAN Gas FUNDAMENTALS

MANUFACTURED GAS

A CONTINUING EDUCATIONAL AND REFRESHER COURSE IN GAS TECHNIQUES, OPERATIONS AND MANAGEMENT

# *Interchangeability of Various Fuel Gases*

INTERCHANGEABILITY of gases means the possibility of using a substitute gas for the gas usually distributed for domestic and industrial consumption, without upsetting the operation of appliances or other gas-operated equipment.

The subject is complicated by many factors such as heating value, specific gravity, and composition of the various gases under consideration.

The present supply of natural gas has resulted and probably will continue to result in the distribution in many cities of gases of rather high heating value. In many cases, straight natural gas has a heating value in excess of 1,000 Btu per cubic foot.

It was concluded that interchangeability of higher heating value gases could best be treated mathematically if considered from three distinct viewpoints, the tendency of high heating value supplemental gases to *lift, flashback* and *produce yellow tips.*

The speed of flame propagation, or ignition velocity, is very important in consideration of the burning characteristics of different gases.

Fast-burning constituents, such as hydrogen and acetylene, accelerate the rate of flame propagation with a tendency toward flashback, whereas slow-burning constituents, such as methane and illuminants, produce little tendency to flashback but may result in lifting the flame.

An equation to predict occurrence of lifting as a result of interchange of gases was developed which takes into consideration change in input-rate and primary air injection resulting from the substitution as well as differences in lifting characteristics of the two gases.

The index of lifting interchangeability, $I_L$, is the result obtained from calculation of the lifting interchangeability equation:

$$I_L = \frac{K_a}{\frac{f_a}{f_s}\,\frac{a_s}{a_a}\left(K_s\text{-log}\,\frac{f_a}{f_s}\right)}$$

An empirical expression was developed to denote the tendency of burners to flashback as a result of interchanging a supplemental gas for natural gas.

The index of flashback interchangeability, $I_F$, is the result obtained from calculation of the flashback interchangeability equation—

$$I_F = \frac{K_s}{K_a}\,\frac{f_s}{f_a}\,\sqrt{\frac{h_s}{1000}}$$

An equation was developed for determining conditions of interchange which would result in yellow tip formation. This equation takes into consideration changes in primary injection and yellow tip limit resulting from substitution of one gas for another.

Calculation of this equation gives value for the index of yellow tip interchangeability, $I_Y$.

$$I_Y = \frac{f_s}{f_a}\,\frac{a_a}{a_s}\,\frac{Y_a}{Y_s}$$

In order to obtain values for these three equations, certain other equations must be employed:

Air theoretically required for complete combustion,

$$\text{per 100 Btu } a_a = \frac{100\,A_a}{h_a}$$

$$\text{Primary air factor } f_a = \frac{1000\,\sqrt{d_a}}{h_a}$$

$$\text{Lifting limit constant } K_a = \frac{F_a}{d_a}$$

$$\text{Yellow tip limit } Y_a = \frac{100\,T_a}{A_a + 7E_a - 26.3\,O_{2a}}$$

The nomenclature for that equation is:

A = air theoretically required for complete combustion, cubic feet per foot of gas
a = air theoretically required for complete combustion, cubic feet per 100 Btu of gas
d = specific gravity (air = 1.0)
E = total inerts in gas mixture, decimal volume
F = lifting constant
f = primary air factor
h = gross heating value, Btu per cubic foot
$I_F$ = index of flashback interchangeability
$I_L$ = index of lifting interchangeability
$I_Y$ = index of yellow tip interchangeability
K = lifting limit constant
$O_2$ = oxygen in gas mixture, decimal volume
T = yellow tip constant, cubic feet of air required to eliminate yellow tips per cubic foot of gas
Y = yellow tip limit, per cent primary air
Subscript a = adjustment gas
Subscript s = substitute or supplemental gas.

### *Type of Natural Gas*

In this work, American Gas Association assumed that one of the three types of natural gas presented in Table 1 would be the adjustment gas or the gas normally distributed.

For any proposed adjustment, or substitute gas, all three indices must fall within certain numerical limits, which are shown in Table 2.

When burners are properly adjusted on the base load gas, these preferable limits can be exceeded, the degree of variation depending on the adjustment natural gas.

When values of the interchangeability indices are intermediate between the preferable limit and the objectionable

limit, each particular situation must be carefully analyzed to determine the limits of interchangeability.

The same formulae given can be used to determine the percentage of adjustment gas which must be retained in admixture with the supplemental gas to bring values of the interchangeability indices within desirable limits.

In arriving at the formulae given here, American Gas Association Laboratories selected many critical appliances and adjusted them for a given type of natural gas. Substitute gases were then prepared and supplied to the appliances and observations made of the operating characteristics of each burner. If complete substitution of the supplemental gas resulted in unsatisfactory performance of any of the control appliances, further studies were made with portions of the base natural gas added to the supplemental gas. In this manner the limiting percentage of supplemental gas could be determined.

In this same reference a comparison is given of a burner operating on the high Btu natural gas compared to carbureted water gas of 1,000 and 1,200 Btu per cubic foot. It was found that only 40 per cent of these carbureted water gases could be mixed with the original natural gas and still maintain satisfactory combustion characteristics.

### *Base and supplemental gases*

It is apparent that no generalized statement can be made regarding the interchangeability of high heating value substitute gases with natural gas. Rather, it is necessary to make a very careful comparison of the proposed supplemental gas with the base, or adjustment gas.

In order to demonstrate the manipulation of the equations outlined, a comparison has been made using as a base, or adjustment gas, a natural gas, the analysis of which is given in Table 3, together with a substitute high Btu oil gas of the characteristics listed. The results are shown in Table 4.

By comparison, it is seen that 100 per cent of this particular supplemental gas could not be used to replace natural gas of the type considered, since all three indices—lifting, flashback, and yellow tip—are in the objectionable range.

The mixture of 50 per cent oil gas with 50 per cent natural gas appears to be satisfactory from the standpoint of flashback. The lifting index and yellow tip index are almost exactly at the objectionable limits, so close that more natural gas is desirable. The mixture of 30 per cent oil gas with 70 per cent natural gas gives indices, none of which are in the objectionable range and which, in general, approximate the preferable range.

Accordingly, it is considered that 30 per cent of this oil gas could safely be used in admixture with the natural gas available. Possibly this proportion of oil gas could be exceeded, but probably not beyond 50 per cent. The proportion of this oil gas which can be used would probably be increased if the oil gas were scrubbed to remove some undesirable constituents.

The particular oil gas used in the foregoing discussion is one which has been proposed as a supplement or substitute for natural gas. This gas is not necessarily the best or only substitute for natural gas. It is used merely to illustrate the application of equations derived for determining the interchangeability of gases of high heating-value. Later research may show that oil gases, or other gases, may be more nearly interchangeable with natural gas than is indicated by present knowledge on the subject.

AGA, after considerable testing, evolved the so-called Index C, calculated from a mathematical equation involving heating value, specific gravity, and chemical analysis of the base and supplemental gases. Index C was supposed to be a criterion of interchangeability of gases with heating values below 700 Btu per cubic foot. If the supplemental gas had a C index in the range 0.85 to 1.15, it was indicated that it could replace the base gas and maintain satisfactory appliance performance.

The equation is:

$$C = \frac{h_s}{h_a}\,\frac{A_s}{A_a}\,\frac{d_a}{d_s} + (K_a - K_s)$$

where,

C = index of interchangeability
a = subscript denoting adjustment gas
s = subscript denoting substitute gas
h = gross heating value, Btu per cubic foot
A = air theoretically required for complete combustion, cubic feet per cubic foot of gas
d = specific gravity of gas (air = 1.0)

$K = \frac{hA}{5000\ E\ F}$, in which

E = the heat capacity of the theoretical products of combustion (from one cubic foot of gas) per degree F between 60° F and 1,600° F, in Btu. E is equal to $0.029\ VCO_2 + 0.023\ VH_2O + 0.0189\ VN_2$ where V

TABLE 1
ANALYSIS OF NATURAL GASES
By type of gas

| | | High Btu | High Methane | High Inert |
|---|---|---|---|---|
| Carbon dioxide | $CO_2$ | 0.5% | 0.0% | 0.5% |
| Methane | $CH_4$ | 83.0 | 94.5 | 71.4 |
| Ethane | $C_2H_6$ | 16.0 | 0.0 | 14.0 |
| Propane | $C_3H_8$ | 0.0 | 0.0 | 1.0 |
| Nitrogen | $N_2$ | 0.5 | 5.5* | 13.1 |
| Total | | 100.0 | 100.0 | 100.0 |
| Btu/cu. ft. | | 1115 | 959 | 1000 |
| Sp. gr. | | 0.64 | 0.56 | 0.69 |

* Inerts.

TABLE 2
INTERCHANGEABILITY INDICES OF NATURAL GASES
By type of gas

| Type of natural gas | Interchangeability Index $I_L$ | $I_F$ | $I_Y$ |
|---|---|---|---|
| High heating value | | | |
| Preferable | Under 1.0 | Under 1.18 | Above 1.0 |
| Objectionable | Above 1.12 | Above 1.2 | Under 0.7 |
| High methane | | | |
| Preferable | Under 1.0 | Under 1.18 | Above 1.0 |
| Objectionable | Above 1.06 | Above 1.2 | Under 0.8 |
| High inert | | | |
| Preferable | Under 1.0 | Under 1.18 | Above 1.0 |
| Objectionable | Above 1.03 | Above 1.2 | Under 0.9 |

is the volume in cubic feet of each product (as indicated by the subscripts) formed by the combustion of one cubic foot of gas with the air theoretically required for complete combustion. The values 0.029, 0.023 and 0.0189 are, respectively, the heat capacities per degree F of $CO_2$, $H_2O$ and $N_2$, between 60° F and 1,600° F in Btu per cubic foot.

F = Summation of the products of the mole fractions and some constant for each combustible constituent in the gas.

### *Objections to index C*

Several objections have been cited against the use of Index C in some cases. The formula is quite satisfactory for the usual mixtures involving the normal manufactured gases, although it does not apply for mixtures in which the percentage of inerts exceeds the free hydrogen content. It is also applicable in the comparison of many natural gases, but it is not generally applicable for mixtures involving adjustment and substitute gases of widely differing heating value or chemical composition unless the fraction of such radically differing gas in the substitute mixture does not exceed about 12 per cent.

Thus the formula does not hold for such substitute mixtures as propane or butane and air, of natural gas inert mixtures when substituted for the usual low Btu manufactured city gas. It is satisfactory if the high heating value hydrocarbon does not exceed about 12 per cent in the final substitute mixture.

The formula does not usually apply in cases involving the use of large amounts of oil gases as substitutes for natural gas. It was, in fact, found to be not fully applicable for gases of heating values higher than 800 Btu per cubic foot since the equation has no factors which predict the occurrence of yellow tips or lifting.

Several simpler formulae have been proposed for use in determining the interchangeability of gases but the Knoy formula is probably the best known:

$$C = \frac{H - 175}{\sqrt{G}}$$

C = a constant

H = heating value of gas, Btu per cubic foot

G = specific gravity of gas (air = 1)

175 = the heating value in Btu per cubic foot of the primary air-gas mixture which is assumed to be the proper adjustment for domestic burners.

The theory of this formula is that gases which have the same C factor are interchangeable. Actually the normal flexibility of most domestic appliance burners allows some variation in the C factor. This deviation will not usually exceed 10 per cent up or down from the C factor of the adjustment gas. C factor for substitute gases which are above that of the adjustment gas indicate softer types of flames, while harder flames are indicated if the C factor is found to be below that for the adjustment gas.

Results obtained by the use of the Knoy formula may be misleading if the chemical composition of the substitute gas does not correspond to that of the adjustment gas and, as a rule, limit mixtures defined by means of AGA Index C are somewhat more reliable than those indicated by the Knoy formula.

National Bureau of Standards has suggested[1] the use of four new indices for representing the interchangeability of fuel gases. They are designated as JL, JF, JY and JI. The first three serve the same purpose as the American Gas Association indices, IL, IF and IY and refer to lifting, flash back and yellow tip, while JI is an expression for the relative tendencies of the gases to liberate carbon monoxide. It is concluded that no single index can be considered useful in comparison with the use of either of the groups of indices mentioned.

The United States Bureau of Mines has reported on the combustive characteristics of fuel gases.[2, 3, 4]

A graphic approach to the problem of interchangeability[5] has been proposed involving a tolerance band or chart which indicates heating valve and specific gravity relationships of substitute gases to provide correct therm input and correct primary aeration when used in appliances adjusted for a given base gas.

The Institute of Gas Technology has presented several

TABLE 3
COMPARISON OF GAS ANALYSIS
Natural gas and proposed substitute high Btu oil gas

| | | Natural Gas | High Btu Oil Gas |
|---|---|---|---|
| Carbon dioxide | $CO_2$ | 0.8% | 6.4% |
| Illuminants | | 0.0 | 25.9 |
| Oxygen | $O_2$ | 0.0 | 0.5 |
| Carbon monoxide | CO | 0.0 | 0.8 |
| Methane | $CH_4$ | 91.0 | 33.3 |
| Ethane | $C_2H_6$ | 3.1 | 0.0 |
| Propane | $C_3H_8$ | 1.7 | 0.0 |
| Butane | $C_6H_{10}$ | 0.7 | 0.0 |
| Hydrogen | $H_2$ | 0.0 | 13.4 |
| Nitrogen | $N_2$ | 2.7 | 19.7 |
| Total | | 100.0 | 100.0 |
| Btu/cu. ft. | | 1047 | 970 |
| Sp. gr. | | 0.61 | 0.88 |

[1] Weaver, E. R., "Formulas and Graphs for Representing the Interchangeability of Fuel Gases," National Bureau of Standards, Jour. Research *46*, No. 3 (March 1951).
[2] Grumer, J., "Study of Combustive Characteristics of Fuel Gases," Interim Report No. 1, Bureau of Mines Project PX3-102 (October 1951).
[3] Grumer, J., Ind. & Eng. Chem *41*, 2756 (1949).
[4] Grumer, J., Harris, M. E., and Schultz, H., Ind. & Eng. Chem. *44*, 1547-59 (1952).
[5] Knoy, M. F., "Graphic Approach to the Problem of Interchangeability," AGA Prod. & Chem. Conf. (May 1953).

TABLE 4
INDICES FOR VARIOUS GAS MIXTURES

| | Lifting Index $I_L$ | Flash-back Index $I_F$ | Yellow-tip Index $I_Y$ |
|---|---|---|---|
| 100% supplemental gas | 1.25 | 1.29 | 0.6 |
| 50% supplemental gas<br>50% adjustment gas | 1.11 | 1.16 | 0.7 |
| 30% supplemental gas<br>70% adjustment gas | 1.07 | 1.10 | 0.8 |

reports[6, 7] regarding the interchangeability of oil gases of high heating value with natural gas.

Oil gases, proposed as substitutes for natural gas, are burned in a group of critical burners and contemporary appliances. Yellow tip, flash back, and blow-off tendencies are determined at three primary aerations corresponding to the following AGA code:

| | |
|---|---|
| + 2 moderately hard | = inner cones distinct and pointed |
| 0 normal | = inner cones rounded, soft tips |
| — 2 moderately soft | = faint inner cones |

Substitutability of the oil gases for high methane natural gas is reported as the maximum proportion of oil gas in the base oil gas mixture which exhibits satisfactory performance on the burners and appliances used.

Many test burners have been devised to assist in evaluating the interchangeability of gases by observation of flame characteristics. At the present time there is no available instrument which can be applied in all cases to evaluate gas quality. In approaching a problem involving interchangeability of gas, it is desirable to make calculations first, using the interchangeability equations and then burn the prepared mixtures in appliances having burners characteristic of those used in the community to be certain that the substitute gases will actually burn satisfactorily.

It is desirable that gas companies keep a control burner at the inlet and outlet of their gas storage holders in order that they may, at all times, have a knowledge of the burning characteristics of the gas being produced and sent out.

Having considered the possibilities of using substitute gases for some normal send out gas, it is apparent that no general statement can be made that any gas will or will not satisfactorily replace another gas. It is necessary that each situation be studied carefully, using the equations given here together with operation of test appliances.

### *Oil gas not complete replacement*

It can be stated that high Btu oil gas, as now known, cannot be used as complete replacement for natural gas. However, reasonably large proportions of these high Btu oil gases can be used in admixture with natural gas without excessive complaints from the consumers of the gas.

It must be pointed out that in some cases substitute gases appear to be entirely satisfactory from the standpoint of visual flame characteristics, but the products of combustion may contain dangerous quantities of carbon monoxide.

[6] Nicol, D. L., Brown, R. A., and Linden, H. R., "Influence of Substitute Gas Compositions on Interchangeability with Natural Gases," AGA, PC-52-7 (May 1952).

[7] Searight, E. F., Boyd, J. R., Parker, R., and Linden, H. R., "Appliance Tests on the Substitutability of High Btu Oil Gas for Natural Gas," AGA, CEP-54-9 (May 1954).

This chapter on Interchangeability of Various Fuel Gases was prepared by Gilbert V. McGurl, manager, gasification branch, fuels processing section, research department, Koppers Company, Inc.

# News of the Gas Industry

## 1954-55 NOMINATIONS SUBMITTED BY AGA COMMITTEE

A list of top executives from gas utility, pipeline and manufacturer company members throughout the United States and Canada has been presented by the general nominating committee of American Gas Association as its slate of general officers, directors, and section officers for submission at the AGA annual convention. Association officers and section chairmen and vice-chairmen will be elected for the 1954-55 association year and directors will be elected for two-year terms expiring in 1956.

Nominees will be voted upon by the membership at the 1954 annual convention, Atlantic City, N. J., October 11-13. The general nominating committee presenting this slate was elected at the 1953 Convention. It includes: N. B. Bertolette, The Hartford Gas Co., acting chairman; Edward G. Boyer, Philadelphia Electric Co.; J. J. Hedrick, Natural Gas Pipeline Co. of America; S. H. Hobson, Geo. D. Roper Corp.; Chester L. May, Lone Star Gas Co.; Robert W. Otto, Laclede Gas Co.; Roy T. Richards, Arizona Public Service Co.; A. H. Stack, The Tampa Gas Co., and H. Carl Wolf, AGA, secretary.

Offices to be filled include those of president, 2 vice-presidents, treasurer, 15 directors and 11 section chairmen and vice-chairmen.

### Nominations for Officers

President: F. M. Banks, president and general manager, Southern California Gas Co.

First vice-president: Dean H. Mitchell, president, Northern Indiana Public Service Co.

Second vice-president: C. H. Zachry, president, Southern Union Gas Co.

Treasurer: Vincent T. Miles, treasurer, Long Island Lighting Co.

### Nominations for Directors

Ernest R. Acker, president, Central Hudson Gas & Electric Corp.

Dudley B. W. Brown, president, Milwaukee Gas Light Co.

F. D. Campbell, president, New England Gas & Electric Assn.

Stuart Cooper, president, Delaware Power & Light Co.

N. Henry Gellert, president, Seattle Gas Co.

Paul Kayser, president, El Paso Natural Gas Co.

Donald C. Luce, president, Public Service Electric & Gas Co.

H. N. Mallon, president, Dresser Industries, Inc.

James F. Oates, Jr., chairman, The Peoples Gas Light & Coke Co.

C. P. Rather, president, Southern Natural Gas Co.

Henry B. Sargent, president and general manager, Arizona Public Service Co.

E. Carl Sorby, vice-president, Geo. D. Roper Corp.

W. T. Stevenson, president, Texas Gas Transmission Corp.

E. H. Tollefson, president, Hope Natural Gas Co.

George E. Whitwell, vice-president in charge of sales, Philadelphia Electric Co.

### Nominations for Section Chairmen

Accounting: A. T. Gardner, vice president and secretary, Delaware Power & Light Co.

General Management: Larry Shomaker, vice-president, Northern Natural Gas Co.

Industrial and Commercial: Ray Trowbridge, commercial and industrial sales manager, Seattle Gas Co.

Operating: Walter H. Davidson, superintendent of operations, Transcontinental Gas Pipe Line Corp.

Residential: Walter H. Kurdelski, sales manager, Michigan Consolidated Gas Co.

### Begin Ill-Natl's Mississippi R. Bridge

Work has begun on the steel superstructure for a natural gas pipeline suspension bridge which will span the Mississippi River, 80 miles north of Cairo, Ill., and which, reportedly, will be the longest main span in the world.

The 3,690-foot bridge with a main span of 2,150 feet is being built by American Bridge div., U.S. Steel Corp., for Texas Illinois Natural Gas Pipeline Co. at a cost of $3,800,000. It will supplement Illinois Natural's present underwater lines.

Two 30" pipelines will be laid from 2 steel framework towers, one on the Illinois side and the other on the Missouri side, near Wittenberg, Mo. The project is part of an Illinois Natural program to pipe natural gas from Texas to north central Illinois for commercial use.

### PGW Seeks Cavity Detection Method

Philadelphia Gas Works div., United Gas Improvement Co., has contracted The Franklin Institute, Philadelphia, to search for a method for detecting holes and caveins under city streets that are not visible on the street surface and that may in time result in leaks in nearby mains.

At present, there is no device that can give conclusive evidence of a subsurface cavity. The practical and perhaps the most difficult way is to develop a machine or instrument that will detect the holes before they become serious enough to cause a leak in a gas main.

The study will begin with a thorough search—from the electrical engineer's, mechanical engineer's and geophysicist's points of view—of literature in the fields of mine detection, seismic testing and depth detection.

### Record High In July Construction

Construction activity in the months ahead will continue at high levels according to F. W. Dodge Corporation July and 7-month totals of Dodge Reports of contracts for future construction.

The July total of $1,836,935,000 of contracts in the 37 states east of the Rockies set a new July high: up 2% over July 1953 and 6% above June of 1954.

An all-time new high for the first 7 months of any year was broken with a total of $11,088,084,000, up 14% above the first 7 months of 1953, and also above the previous 7-month high set in 1951.

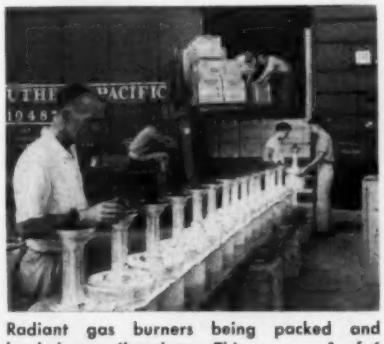
Seven-month categories compared with the same 1953 period were: nonresidential, $4,049,522,000, up 9%; residential, $4,726,131,000, up 21%; heavy engineering, $2,312,431,000, up 12%.

July categories were: nonresidential, $641,513,000, down 2% from June and 16% below July 1953; residential, $745,440,000, up 3% over June and 14% above July 1953; heavy engineering, $449,982,000, up 26% over June and 20% above July 1953.

### Selas In Record Burner Shipment

The largest shipment of radiant burners ever made was completed by Selas Corporation of America recently when some 800 Duradiant gas burners, occupying a total of 6 railroad cars, were shipped to the Gulf Oil Corp. ethylene plant in Port Arthur, Texas.

The burners will be installed at the refinery plant site in 8 radiant heat furnaces, designed by Selas for the plant, which reportedly will be the world's largest ethylene-producing installation. Its capacity is estimated at 7 billion cubic feet annually.




Radiant gas burners being packed and loaded on railroad car. This car was 1 of 6 used for largest shipment ever made.

Designed to produce complete combustion in the furnace wall, the Selas furnace eliminates the existence of open flame in the furnace chamber, which permits construction of relatively small but high productive capacity cracking furnaces. The flameless, ceramic-cup burners can be externally regulated to permit any time-temperature heating curve.

The Port Arthur refinery is being constructed by Stone and Webster's Badger process division, Boston.

### Clopton Retires from United Pipe Line

W. W. Clopton, San Antonio district manager of United Gas Pipe Line Co., who passed his 30th year of continuous service with United Gas and predecessor companies in June, retired August 1.

A veteran of the natural gas industry in the Southwest, Mr. Clopton began his long career with a predecessor company at Kirbyville in 1924 during construction of the original Serepta, La., to Beaumont pipeline. Later he became a section foreman,

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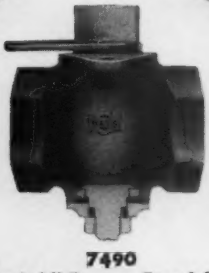

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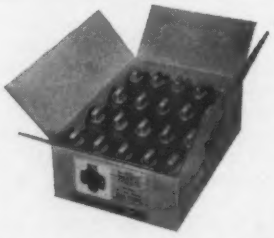

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and in 1936 was promoted to section foreman, at Latex. He became district pipeline superintendent in 1940 and was subsequently promoted to district manager.

Mr. Clopton was transferred to the larger San Antonio district as assistant district manager, in 1946, and a year later was appointed district manager. W. C. Allen has been appointed to succeed Mr. Clopton.

### Rockwell Names 2 to Research Posts

Former chief engineers of 2 Rockwell Manufacturing Co. divisions, Howard J. Evans and H. A. Altorfer, have been promoted to key posts in 2 new central research and development departments being established by the company.

Mr. Evans, former chief engineer of the Pittsburgh Equitable Meter div., has been promoted to chief engineer and manager of the central gas products research and development department.

Mr. Altorfer, former chief engineer of the Nordstrom Valve div., has been named chief engineer and manager, central valve research and development department.

### AGA Readies Convention Plans

Plans for the thirty-sixth annual convention of American Gas Association, to be held October 11-13, at Atlantic City, N. J., are nearing completion and an array of speakers who will discuss many subjects of interest to the gas industry have been scheduled to appear. The various section programs have been arranged and outstanding events are being readied for the general sessions on each of the 3 mornings.

Members of the general convention committee, which is headed by Everett J. Boothby, president, Washington Gas Light Co., have expressed the belief that it will be one of the most successful conventions ever held.

The operating section will hold afternoon sessions on Monday and Tuesday and will feature a demonstration on remote control of pipelines. A simulated pipeline system will be set up with an off-stage control room to be viewed by use of closed-circuit television hook-up. Valves, meters and other equipment will be operated by remote control and panel discussions on customer service, quality control and other pertinent topics will be included. Papers on off-shore drilling and safety codes will be presented.

On Monday afternoon the residential gas section will hold its meeting and Walter H. Kurdelski, Michigan Consolidated Gas Co., chairman of the section, will preside. The program will feature a series of presentations devoted to promotion and sale of residential gas appliances.

Paul E. Ewers, Michigan Consolidated Gas Co., chairman of the accounting section, has arranged programs for the section's meetings on Monday and Tuesday. L. R. Quad, Public Service Electric and Gas Co., N. J., coordinator of the customer activities group, will preside on Monday afternoon and Arthur Skelton, The Peoples Gas Light & Coke Co., will preside at the Tuesday meeting.

The home service breakfast will be held in the morning, October 12, and Mary E. Huck, The Ohio Fuel Gas Co., chairman of the home service committee, will preside. The afternoon meeting, featuring annual

round table discussions and promotional highlights, will be held on Tuesday.

The general management section will sponsor its annual luncheon meeting on Tuesday and a prominent speaker will address the section.

The industrial and commercial gas section will hold its annual luncheon on Tuesday, with an afternoon meeting following with talks on subjects of interest to management and members of the industrial and commercial departments of member companies. Election of officers, reports and other business will round out the afternoon meeting.

L. R. Quad is chairman of the convention entertainment committee.

### Correction: Electrode Article

In the August article on Reference Electrode Location by Leon P. Sudrabin and Joseph A. Lehmann, page 16, the 3rd paragraph should have read:

Among the useful basic values is the protective potential of iron in soil established by Schwerdtfeger and McDorman[3] to be — .85 volts measured against a Cu-$CuSO_4$ reference electrode. This is normally the open circuit potential of an iron electrode in an airfree environment at pH of 9.0.

## INGAA

Continued from page 15

son, executive director of INGAA at our Washington headquarters. He'll be glad to furnish samples of the INGAA materials available and answer questions about our information services.

JOURNAL: Mr. Wilson, we've discussed the operation of your program, and the general purpose behind it, but let's get a little more specific. In your opinion just what are your big problems—the ones the entire gas industry is facing?

WILSON: There are always problems to be met and solved in every industry. It is my firm belief, and I know many share such a belief, that the principal problems of the natural gas industry stem from the need for keeping ahead of the demands of present and future consumers by developing even greater sources of supply. Obviously we have to *get* the gas or we won't have an industry at all. Here we have 21 million customers—homes and industries—depending on natural gas to do an increasing number of jobs for them. They have a tremendous amount of money tied up in gas equipment, ranges, furnaces, incinerators, water heaters, clothes dryers and refrigerators in the home; tremendous ovens and ranges in bakeries, restaurants and institutions; to say nothing of the many millions of dollars invested in industrial equipment. Don't you agree that such a tremendous investment is worth every possible effort to protect?

JOURNAL: Definitely, but just how is it being threatened, in your opinion?

WILSON: It is being threatened, I believe, by current developments in the direction of placing the production end of the natural gas business in the category of a utility for regulatory purposes. It is unfortunate that many consumers, and even some people in the industry, view the idea of treating the business of producing natural gas as a utility function as beneficial to their interests.

JOURNAL: You don't feel that way, obviously.

WILSON: I certainly don't. Any attempt to regulate the business of producing natural gas as a public utility cannot be in the public interest. Its effect will be to kill the incentive to search for new gas reserves.

### Need for incentive

JOURNAL: How does that figure?

WILSON: It takes a lot of incentive—and I mean profit-incentive—for people to risk millions of dollars in the search for gas and oil. When the chance of success is so slim—the odds on a successful well being completed in an unexplored area on a national average, are 1-in-9—would you want to risk millions in a venture that, even if successful, would bring only a small return on money invested under the utility regulation concept?

JOURNAL: Not having even one million, we'll skip your question and ask you to cite a parallel situation that you feel is proof of your position on this score.

WILSON: The amazing development of the gasoline and motor fuel segment of the petroleum industry is a wonderful example of what I have in mind. A quarter of a century or so ago, the use of automobiles and other motor-propelled vehicles was just starting to revolutionize American transportation methods. What do you think


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would have happened if the oil industry had been told at that time that its production activities were going to be regulated as utility functions? Obviously, exploration for and development of oil supplies couldn't have kept pace with the ever-expanding use of motorized transport. We couldn't have maintained a healthy peacetime economy, let alone survive the recent wars.

JOURNAL: So INGAA is trying to alert the public to the fact that it is in its own interest to keep gas exploration and production free of restrictive and unnecessary regulation. Is that the angle?

WILSON: Yes, as I have said before, it just simply cannot be in the public interest for the production end of the natural gas business to be regulated as a utility function. As I see it, it is the duty and responsibility of everyone in our industry to tell the public *why* it is not.

JOURNAL: What other implications do you see in the present regulatory trend?

WILSON: It may appear now to involve only natural gas—but it's inevitable that its effects will spread to other forms of petroleum products. And if those natural resources are so regulated, others, such as minerals and ores could be next. Any further stifling of the incentive to add to the Nation's gas reserves would be extremely unfortunate.

### Cooperative effort

JOURNAL: Mr. Wilson, getting back to the manner in which the INGAA public information program operates as an all-industry, coordinated effort, how do you view the recent efforts to bring about closer coordination among the various organizations of the gas industry?

WILSON: One of the key operating principles of our association's information program from the outset has been to work in cooperation with other gas associations. As a matter of fact, when we inaugurated our program, we presented its plan of operation and objectives to every oil and gas association in the country to let them know what we were doing and to encourage their use of our materials and to work with us. We are proud of the fact that INGAA paved the way for regional gas industry public relations workshops with pilot conferences in Dallas last September and in New Orleans in March of this year. As coordination of activities has progressed, we have joined other natural gas industry organizations in sponsoring regional industry information meetings—one in Boston in June and another in Omaha in July. We trust this activity will be continued in other areas with other regional groups in coordination with AGA, Gas Appliance Manufacturers Association and the National LP-Gas Association as cosponsors. The leaders in every branch of the natural gas business recognize the threats facing them—they are common threats. In the public interest, as well as our own, it is up to that leadership to use the combined talents and facilities of all our industry associations, as well as our individual organizations, to tell the public the facts about every phase of our operations before we find ourselves in the "too little and too late" category.

JOURNAL: Thank you, Mr. Wilson.

## 20,000 METERS

Continued from page 14

*current bills are reflecting a proper reduction in cost under the 35 per cent average rate decrease now effective.*

*In your own case, however, we must report that careful inspection of the meter just removed from your premises shows it to have been a defective meter and not properly registering the quantity of gas being consumed at your address.*

*We are setting aside the Company's standard policy in this incident and are not seeking any further payment from you; but, since your future bills will show all the gas you use, they might not reflect the savings expected.*

*We believe you will be fair with us in understanding that our only means of knowing the quantity of gas being consumed is by the recording of the new accurately registering meter.*

With each letter, South Atlantic enclosed a comparison of sample residential bills to customers under the December 1953 rate schedule as compared with the reduced rate schedules placed in effect for natural gas.

When workers arrived in Savannah, South Atlantic, Shriver Conversions and American Meter had worked out a well-planned orientation course. The 22 workers, each an expert in his line, literally went back to school so that all procedures would be standardized and all methods agreed upon. Such procedures included changeout of meter, completion of 3-part forms on every meter removed, how to soap test all connections for leaks and how to check house piping for leaks by using the meter test hand for 3 minutes. In the event any house piping leaks were found, workers were to turn off the gas and promptly notify South Atlantic.

This procedure was called for in the contract with American Meter Company. If no house piping leaks were found, and when all other connections were tight, workers turned on the gas, purged the system, lighted all pilots then in use, checked the new meter to insure its being in good operating condition and then notified the customer that the gas could be used in the appliances.

The contract also called for new meters to be "proved" by American Meter Company before they left that company's shops. They were shipped by truck in individual cardboard cartons and unloaded by hand when they arrived in Savannah. Three per cent were spot-checked for accuracy and not one was found to be off "proof."

Of the 22 Shriver Conversions' workers on the project, 17 handled the changeout of the meters, 2 drove trucks, 2 worked in a temporary office opened by American and Shriver and one served as supervisor of the project with 2 American Meter Company representatives.

"CGI's" or "Can't Get Ins" presented a temporary problem as 2,000 customers were not at home on first calling, but all were gradually eliminated by callbacks as the work progressed.

South Atlantic is completely happy with its meter changeout for the Savannah area and believes its customer relations program is at the highest peak in its 106-year history, but its highest valuation is given to the approval expressed by the people of Savannah and by individual members and staff of the Georgia Public Service Commission.

There seems general agreement that the "Savannah Plan" is Mr. Hillyer's brainchild. He, however, insists that but for the cooperation of C. B. Reinschmidt and W. E. Benfield, vice presidents of South Atlantic, of Murray Hitchcock, American Meter Company, Atlanta, and that company's entire official staff in Philadelphia, together with Shriver Conversions; and the helpfulness of Arthur Andersen & Co. and Ebasco Engineers, in proving out his theories, the plan would never have passed beyond the stage of conversation.

## *NYS Natural Using Gas-Drilling Technique*

New York State Natural Gas Corp., pioneer user of the shaped charge for vertical shooting in drilling operations in the Clinton county, Pa., gas field, has introduced a new drilling technique to the Appalachian area with the successful substitution of air or natural gas for mud in the Benezette field, Elk county, Pa.

Well production will be favorably affected and drilling time appreciably shortened by employment of the new method, in which air or natural gas is used as the medium for carrying cuttings out of the hole.

Use of the mud-drilling method necessitated a time-consuming changeover to cable tools at the casing point—the point just above gas-bearing sands where the tools are withdrawn from the hole and production casing is set in place.

With the new technique, New York State Natural, to eliminate the danger of combustible air-gas mixtures when gas-bearing sands are penetrated, completes the drilling-in with gas from one of its nearby lines.

Cable tools are necessary with this drilling method only where there are no lines available for tap.

While gas-drilling has been used extensively in one area of the southwest, the San Juan basin, the new technique is only now being put to practical use in other major gas and oil producing areas, according to company authorities.

Two major drawbacks encountered in mud-drilling have been eliminated with the use of the new technique:

Unavoidable seepage of mud into gas-bearing sands, causing a partial block and resultant reduction of well production; and, in winter, fluid-freezing.

In addition, a statistical comparison of 2 wells, drilled under similar conditions, revealed that the air-drilling method results in a substantial reduction in total drilling time and a longer life for drilling tools.

Credit for introducing this revolutionary drilling technique to the Appalachian area is shared by Edward C. Inghram, general superintendent of New York State Natural, and one of the principals in the development of the shaped charge technique; and Guy White, vice president, Delta Drilling Co.

Company spokesmen have expressed the belief that the new technique will be used extensively in future drilling operations.

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# How to Avoid Employment Contract Liability

The higher courts consistently hold that to avoid legal controversies, all employment contracts between gas companies and employees should be in writing with the complete agreement clearly explained, without ambiguity. The full and complete intentions of the contracting parties should be outlined and explained in writing so that there are no doubts in the minds of reasonable persons, regarding the rights, liabilities and obligations of the parties.

Under all circumstances verbal employment contracts should be avoided because the courts must rely upon verbal testimony to construe the original intentions of the parties. Invariably, such testimony is contradictory and a jury must decide what testimony is dependable.

It is universal law that verbal employment contracts which cannot be performed within one year, are rendered void by the Statute of Frauds. On the other hand, the courts hold that a verbal contract verified by correspondence legally becomes a valid written contract.

See Bertlee v. Illinois 52 N. E. (2d) 47. Here the parties made a verbal contract which could not be performed within a year, but the parties verified the contents of the verbal agreement by correspondence. In subsequent litigation, the court held the verbal contract valid and effective because it was verified in writing.

Therefore, contracting parties may make a void verbal employment contract, which cannot be performed within one year, but if subsequent correspondence passes between the employer and the employee, which verifies such verbal contract, the agreement acquires the legal status of a written contract and is valid and effective. Notwithstanding this law, it is advisable to avoid litigation by having all employment contracts in writing.

### Intentions are important

Notwithstanding the above explanations of law, it must be remembered that the intentions of contracting parties are most important.

For example, in Green v. Doniger, 90 N. E. (2d) 56, a sales manager and a gas company representative made a verbal contract of employment. After a few months had expired, they signed a written contract which contained a clause to the effect that all verbal agreements were cancelled and the written contract expressed the sole and entire agreement, and that the written contract could not be modified except by writing. Later, in complete disregard of the written contract, the parties agreed orally to modify the written contract.

In later litigation the higher court held that, notwithstanding the clause in the written contract which specified that it could not be modified except by written agreement, the parties could verbally agree to modify the written contract. The court said:

"It is fundamental that a contract must be construed according to the expressed intent of the parties. The problem of whether there was a mutual consent to the abandonment involves questions of fact which should be tried before a jury."

### Employee changes jobs

As explained, a clause in a written employment contract is valid which restricts an employee of a gas company from taking employment with a competitor for a period of one to five years in territory he covers for his employer.

According to a court decision, such a restrictive clause remains valid and effective although the status of employment is changed.

In Henges Company v. May, 223 S. W. (2d) 110, the testimony showed: One, May, took employment as a salesman. The employer and employee signed a written contract of employment which contained a restrictive clause that May would not, for the period of one year from the termination of his employment under such contract, engage in the same or similar business as that carried on by the Henges Co. in the territory over which his employment had extended.

After May had worked as a salesman for several months, he was made sales manager, which he remained for a short while, after which he resigned and took employment with a competitor. The Henges Co. then filed suit and asked the court to issue an injunction to prevent May from continuing employment with the competitor.

May argued that he was not obligated by the restrictive clause in the written contract which employed him as a salesman because later he was employed as a sales manager. However, the court held that since the first employment contract had not been cancelled, May was obligated by the restrictive clause. The court granted an injunction preventing May from working for a competitor of the Henges Co.

This court explained that when May was promoted to the position of sales manager, he should have made a new contract which did not contain the restrictive clause, and then May could have taken employment with a competitor without interference of the Henges Co. —L.T.P.


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## FALVEY

Continued from page 23

to the prices they will pay. We believe that, with the narrow spread between yields on common and preferred stocks and bonds, this limit is being reached. In fact, it is reported that some mutual funds are already *selling utility common stocks* even though they are continuing to accumulate additional funds.

We, therefore, feel that utilities, which are selling far above their book value, are approaching their peak, if they have not already attained it. During the past 2 weeks some price weakness has developed in individual issues which are selling 1 to 2 points below their highs. In view of the unsettlement in the market it is difficult to say whether this is an indication or forerunner of a general decline; but, with prices higher in relation to dividends and earnings than at almost any time in the past 9 years, we believe that, as a group, utilities are overpriced and should be sold.

Granting, however, that yields on leading utility common stocks have dwindled sharply under the urge of investment demand, it might be well to remember that some of the advisers now cautioning against utility shares being overpriced held to the opinion less than a year ago that the entire economy was "going to hell in a hack" paced by steels. A look at the record will suffice to lay that worry at rest.

### Robertshaw-Fulton Gets Toronto Plant

Robertshaw-Fulton Controls Co. has announced its new Canadian subsidiary has acquired a modern manufacturing plant in the Toronto area on a long term lease, and plans to start operations in late summer.

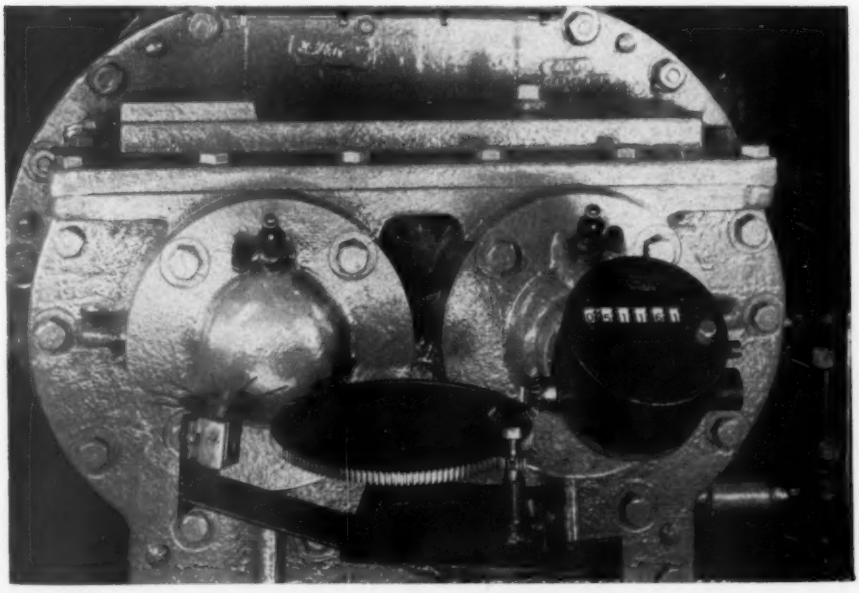
The subsidiary, formed earlier in the year, will assemble and manufacture thermostatic controls for Canadian customers in the kitchen range, water heater and space heater fields.

### Oklahoma Natural Names 5 VPs

Five district managers of Oklahoma Natural Gas Co. were promoted to the position of district vice president by the company's board of directors. They are: A. F. Holmes; E. C. McAninch; C. H. Rich; P. V. Root, and T. H. Sterling.

The 5 new vice presidents have combined service with Oklahoma Natural and predecessor companies totaling 144 years.

## *Brooklyn Union Using Meter-Testing Aid*



The assistant superintendent of the meter repair section, The Brooklyn Union Gas Co., Fred Depp, recently solved a problem in connection with the testing of Connersville meters when he devised a gear train which magnifies the reading so that the index can be read more accurately.

The meters are of the rotary type used in measuring large industrial loads with speedometer type indexes which read in increments of 1,000 cu. ft.

During testing, a quantity of air or gas is discharged through the meter from another accurately calibrated meter or proving device. While the latter meter can be read accurately in cubic feet, the Connersville meter cannot be read more closely than the nearest 1,000 cu. ft.

The gear train devised by Mr. Depp has a suitable mounting unit which permits temporary attachment to any size Connersville meter. A miter gear is attached to the revolving shaft, which drives the index, and this drives a second miter gear mounted on a vertical shaft. This shaft has a 12-tooth spur gear which is used to drive a 144-tooth gear.

The face of the 144-tooth gear is marked out in divisions, each of which, when multiplied by the gear ratio of the meter being tested, represents a certain number of cubic feet. A vertical pin near the edge of the 144-tooth gear engages a 10-spoke wheel which drives a small Veedor counter.

The device has demonstrated itself to be a valuable improvement.

## MEN AT WORK

E. M. CANNON has been promoted to Houston div. manager, Texas distribution div., *United Gas Corp.*

F. D. KRUSEMARK was appointed resident engineer, Dallas, *Bailey Meter Co.*

LEROY G. MALLOCH is now east Texas div. manager, Texas distribution div., *United Gas Corp.*

C. L. MORGAN has been named operating superintendent, Texas distribution div., *United Gas Corp.*

ELLO E. RICHARDSON was named assistant general manager, *Cambridge Gas Light Co.*

CHARLES UNRAH has been appointed sales representative, Pacific Northwest, *Robertshaw-Fulton Controls Co.*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### Utility Buyers Elect Officers

Fred D. Bradley, purchasing agent and assistant treasurer, Southern Union Gas Co., was elected chairman of the public utility buyers' group, National Association of Purchasing Agents, at the national convention in Chicago. Other officers elected were: 1st vice-chairman, Robert F. Isenhart, The Dayton Power & Light Co.; vice-chairman, L. G. Wiseley, Michigan Consolidated Gas Co.; vice-chairman, Harold T. Belcher, Consumers Power Co.; and secretary-treasurer, R. H. Sperreng, Union Electric Co. of Missouri.

Members elected to the executive committee were: C. P. Altland, Southern California Edison Co.; Charles Auringer, Commonwealth Edison Co.; F. E. Baxter, Pacific Gas & Electric Co.; J. R. Carmichael, Georgia Power Co.; George H. Cole, Alabama Power Co.; Mark B. Covell, Union Electric Co. of Missouri; John I. Evans, Ohio Edison Co.; James K. Hall, Columbus & Southern Ohio Electric Co.; G. L. Haszard, British Columbia Electric Co., Ltd.; J. Donald Hogg, The Cleveland Electric Illuminating Co.; J. B. Homsher, Gilbert Associates, Inc.; W. H. Jones, Philadelphia Electric Co.; Stephen J. Kennedy, Springfield Gas Light Co.; J. R. Millikan, Dallas Power & Light Co.; James J. Morse, New Orleans Public Service, Inc.; Ben R. Newbery, Lone Star Gas Co.; Chester F. Ogden, Detroit Edison Co.; Robert E. Shillady, New England Power Service Co.; R. V. Spangler, Duke Power Co.; Newman C. Stirewalt, Central Illinois Public Service Co.; Russell C. Wenz, Duquesne Light Co.; Daniel E. Winslow, West Penn Power Co.; and Arthur Ziegler, Consolidated Gas, Electric Light & Power Co. of Baltimore.

The public utility buyers' group, consisting of representatives of over 300 utility companies, is the largest single group within the National Association of Purchasing Agents, with more than 16,000 members.

### Elect Sheehan Piedmont Natural VP

James J. Sheehan was elected vice president of Piedmont Natural Gas Co., Inc. at a recent meeting of the board of directors. As vice president, he will continue to be responsible for all residential and commercial sales.

James J. Sheehan

Mr. Sheehan joined Piedmont Natural as sales manager in 1951. Previously, he was sales manager of Southern Union Gas Co., which he joined in 1940. He has been active for many years in gas associations throughout the county, and is presently a member of American Gas Association and Southern Gas Association.

### Pac NorWest Pipeline Signs Dist Cos

Contracts to serve natural gas to virtually every Washington State community along the Pacific Northwest Pipeline Corp. route have been signed with distributing companies, Robert R. Herring, vice president in charge of marketing for the company, said recently.

"We expect to start negotiations for the necessary financing for our line in the very near future," said Mr. Herring. "We anticipate no serious delays in getting gas to the Northwest. Our target date for the arrival of gas here is late next year."

Pacific's plan for financing contemplates initial financing amounting to $160 million, to be realized through the sale of $120 million in bonds, sold at par; $18 million in 6% interim notes; and $22 million in common stock, at $10 per share.

Contracts have been signed with Seattle Gas Co., Spokane Gas and Fuel Co., Washington Gas and Electric Co., Cascade Natural Gas Corp., United Gas Co., California Pacific Utilities Co. and Twin Cities Gas Co.

### Red-Ray Mfg Co Moves Plant to NJ

Red-Ray Manufacturing Co., Inc., in late August began moving all of its office and manufacturing facilities from New York to its new plant at Cliffside Park, N. J.

The move represents an expansion which will provide improved service for customers and more working space for the company's manufacturing of radiant gas burners.

### Hold SGA Gas Gathering Conference

The Southern Gas Association natural gas gathering round-table conference was held August 20, and individuals from 17 companies participated. E. F. Hindman, Louisiana Natural Gas Corp., sponsored the round-table.

After the opening remarks presented by


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Iron Sponge is your key to sulfur-free gas at minimum processing cost. Iron Sponge has high efficiency at low pressures or at today's high pressures and high temperatures. It absorbs *more* $H_2S$, gives long service between foulings, and is easily regenerated. Investigate it for your purification problem today!

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Gas Fundamentals

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*American Gas Fundamentals* is just one more reason why you should have your own copy of the *new* GAS JOURNAL. Uniform 4-page chapters of *Fundamentals* will appear each month, as they have since January 1951.

A FEATURE OF

AMERICAN Gas Journal

Robert R. Suttle, managing director, Southern Gas Association, there were discussions on many subjects relating to natural gas gathering including; field compressors, well operating responsibilities, the proper use of heaters, the future status of gathering companies in light of recent Supreme Court decisions, and temperatures.

### Max W. Ball

Max W. Ball, petroleum consultant and former chief of the U.S. Interior Department's Oil and Gas div., died August 28 at the age of 68.

A geologist and petroleum engineer, Mr. Ball began his career with the United States Geological Survey. During World War II, he was a special assistant to the deputy petroleum administrator.

## NEW BULLETINS

WACHS GUILLOTINE PIPE SAW. A portable power pipe saw for on-the-job cutting of 2″ to 8″ cast iron and steel pipe is described in this new bulletin. Weighing 120 lbs. the unit reportedly can be set up by one man in a few seconds. A chain type pipe vise with steel V base gives positive grip and perfect alignment on pipe to assure right angle cuts, the bulletin states. The saw will cut 6″ standard wall cast iron pipe in 4 minutes, 6″ standard wall steel pipe in 8 minutes. Cuts pipe with wall thickness up to ½″. The unit has a steel blade 12″ long, makes a 2″ stroke; approximately 25 cuts between sharpenings.

The E. H. Wachs Co., 1525 No. Dayton St., Chicago 22.

HARDENING AND DRAWING IN SURFACE FURNACES. The company's complete line of furnaces for hardening and drawing or tempering operations is described in this bulletin. Included are direct-fired and controlled atmosphere furnaces of both batch and continuous types. A table is presented which provides data on the hardness achieved at specific drawing temperatures for the most common steels.

*Bulletin SC-164.* Pp. 4. Advertising Dep't., Surface Combustions Corp., Toledo 1, O.

PH ELECTRODES AND ELECTRODES FOR MEASURING REDOX POTENTIALS. A new bulletin describing pH electrodes and electrodes for measuring redox potentials and assemblies, parts and accessories, it covers the manufacturer's complete electrode line, chemicals for electrode servicing, and auxiliary electrode equipment such as clamps, holders and thermometers. The bulletin is designed primarily to present electrode assemblies for measurement, recording, and control of solution pH and redox potentials.

*Bulletin EN-S5.* Northrup Co., Advertising Div., 4907 Stenton Ave., Philadelphia 44.

NEW PROCESS TIMER. Information on the company's new process timer is presented in this bulletin. It describes in detail the operation, advantages, and applications of the new unit. Included are connection diagrams for typical applications, as well as installation and cutaway illustrations, prices, specifications, and dimensions.

*Bulletin GEC-1223.* Pp. 8. General Electric Co., Schenectady 5, N. Y.

HOMESTEAD LUBRICATED PLUG VALVES. This new bulletin shows the manufacturer's lubricated plug valves in full-port and venturi types, sizes up to 14″, and with a choice of two-piece plug or one-piece plug designs. Engineering information contained in the bulletin includes principal dimensions, types of control, metals, and lubricants.

*Reference Book 39—Section 5.* Pp. 24. Homestead Valve Manufacturing Co., Coraopolis, Pa.

## NEW BOOKS

PRACTICAL PIPING FLEXIBILITY—DESIGN AND FLOW. By W. A. Thomas.

A new method for rapidly checking by graphs and charts the maximum thermal stress and reactions in piping arrangements between 2 anchors is presented in this book and it should be of interest to engineers responsible for such analyses. By using Mr. Thomas' methods practically no calculation is necessary and it is said that 2 days' work on mathematical calculations can be done in 2 minutes. The book includes a preliminary criterion chart through which the user may determine whether a system is possible and worthy of further analysis. The piping system to be checked is selected from an extensive table of key shapes, and the coefficients obtained from the table are used in two master charts to find maximum stress and reactions. A section of the book includes a new shortcut treatment of thermal stress in plates, bars, and cylinders; a method of rapidly approximating the maximum stress in transversely loaded flat plates of regular and irregular boundaries; an article on design of drum type expansion joints, and formulas for determining the stresses in vessels due to supports.

Pp. 190 + x. W. A. Thomas, 2742 Philadelphia Ave., Pittsburgh 16, Pa. $25.00.

ESSENTIALS OF INDUSTRIAL MANAGEMENT. By Lawrence L. Bethel, Franklin S. Atwater, George H. E. Smith and Harvey A. Stackman, Jr.

Presenting an overall view of industrial management, this condensed, comprehensive new text emphasizes coordination as the goal of good management. The authors cover not only the technical aspects of industrial management, but also the best approaches to managerial problems.

Pp. 449 + ix. McGraw-Hill Book Co., Inc., 330 W. 42 St., New York 36. $5.00.

## NEW EQUIPMENT

### Domestic meter

With a rated capacity of 225 cu ft/hr of 0.6 sp. gr. gas at ½″ w.c. differential, and working pressure of 5 psi, this new meter is said by the company to meet the need for larger capacity, light weight and low


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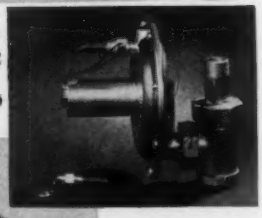

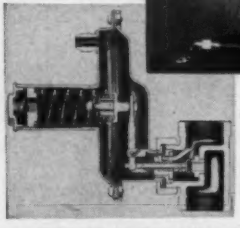

U. S. Patent No. 2,577,480. Other Patents Pending.

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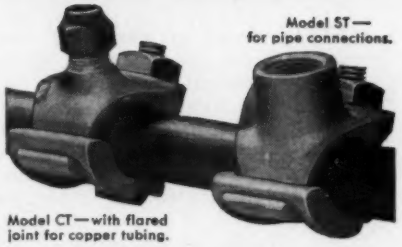

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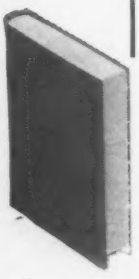

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Not only are the broad functions of management covered, but also such special problems as industrial risk and insurance, the coordination of *all* management activities, and the effect of automation and process-integrated materials-handling systems. Recent significant trends in plant location, building construction, design of equipment, control of production, mechanization of office work, executive development, organization for sales, budgeting, cost control, communications, etc., are discussed in detail, with numerous examples to illustrate each basic point. Special features of the book are the sections on industry's relations with the world outside its doors and its role in the betterment of working conditions.

**AMERICAN GAS JOURNAL**
**205 East 42 Street**
**New York 17, N. Y.**

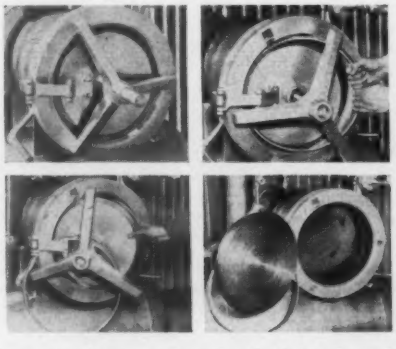

cost in positive displacement gas meters for domestic service. Features of the new meter include the use of pressure die-cast aluminum alloy construction to reduce weight while providing high-impact resist-

ance. Interior construction includes parts changeability; permanently self-lubricated porous bronze bearings; choice of synthetic or leather diaphragms and new grommet-type bushings for positive leak protection. The meter's index box is of clear, strong plastic providing resistance to injury and ease of reading.

*5B-225 Aluminumcase Meter.* American Meter Co., Erie, Pa.

### Pressure closure

Designed for all types of pressure vessels and piping systems, this new type closure incorporates an internal pressure clos-

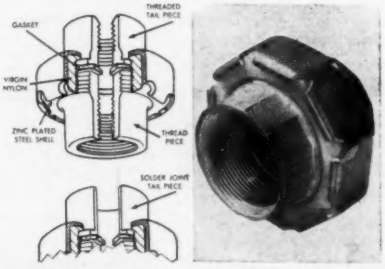


ing, metal-to-metal seal principle. It seals tighter as the pressure upon it increases. The unit consists of 4 main parts; weld neck, plug, gasket and spider. The company reports that the unique feature is the patented flexible metal gasket held in compression between the plug and weld neck. The gasket is flexed to an elliptical shape to allow it to pass through the plug opening. In place, tightening the spider nut causes the gasket to return to a round shape for proper seating position. Standard closures are available in same pressure ratings as ASA flanges and have same pressure and temperature rating as corresponding ASA raised face flange.

*Flex Ring Closure.* Sillers Engineering Co., Box 7193, Dallas.

### Pipe union

New sizes in insulating or dielectric pipe unions, which serve as unions and electric circuit breaks to stop the flow of stray electric current, have been introduced by the company and a range of sizes from ½" to 2" are now available. The units offer protection against galvanic corrosion and electrolysis in piping systems where any 2 dis-




similar metal pipes are connected. Feature of the union is the insulating nut of zinc-plated steel shell containing nylon core. The insulating pipe unions are applicable in systems for gas, water, steam and all types of fluids.

Universal Controls Corp., 731 W. Davis St., Dallas 8.

### Recorder-controller

Fast, continuous measurement and control of rate-of-heat input or output are said to be possible through the use of the new recorder-controller systems announced by the manufacturer. These can be used to measure and record the quantity of heat supplied to or drawn from process vessels and a variety of heat-exchanging devices. Control apparatus is available for regulating the temperature or flow-rate of the heat-transfer medium. In the basic recording system, one unit measures the tempera-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ture difference with two resistance thermometer bulbs and receives the flow-rate from a flow transmitter. From the 2 variables it then continuously computes and records the Btu product.

*Dynamaster.* The Bristol Co., Waterbury, Conn.

### Crane carrier

A 6 x 6 crane carrier with 1-man cab, this redesigned model carrier features a 40 mph road speed, a 2-speed transmis-

sion with 10 forward speeds and 2 in reverse, and 6-wheel drive to provide extra traction. The rig reportedly has an extremely short turning radius enabling the user to work with the rig in cramped quarters. The carrier has a 6-cylinder engine, a number of new assemblies, reinforced main frame, and completely rebuilt secondary assemblies. The model carries a 60-day warranty against defective parts or workmanship.

*Model 200.* Schield Bantam Co., Waverly, Ia.

### Controller

This new limit controller is said to provide economical insurance against human or instrument failures which may permit overshooting of critical temperatures. The unit will automatically shut-off fuel sup-

ply at any specified temperature manually set on the indicating scale and, if so desired, will sound an alarm. The instrument incorporates a thermocouple break protection feature which will shut off fuel input in case of thermocouple failure or broken thermocouple connections. Component parts are housed in a 2 compartment case designed for surface or flush mounting.

*700 Series Limitrol.* Wheelco Instruments div., Barber-Colman Co., Rockford, Ill.

### Trencher

A new heavy-duty trenching machine, this model is a full-crawler-mounted, wheel-type trencher which digs up to 36″

wide and to 6′ 3″ deep. Its low ground bearing pressure of 6.3 psi is said to be outstanding because the model is balanced perfectly at the center of its non-packing crawlers which are 100% anti-friction bearing equipped. The trencher features a crawler kick-out clutch which permits stopping the crawlers without halting the digging wheel's operation. Optional bucket sizes range from 20″ to 36″. The 30″ wide reversible conveyor discharges spoil on either side of trench. The model is powered by a 460 cu. in. diesel engine delivering 65 hp at 1,200 rpm. The trencher has 15 large capacity buckets mounted on digging wheel in 3 different series of bucket tooth patterns.

*Model 240.* The Cleveland Trencher Co., 20100 St. Clair Ave., Cleveland 17.

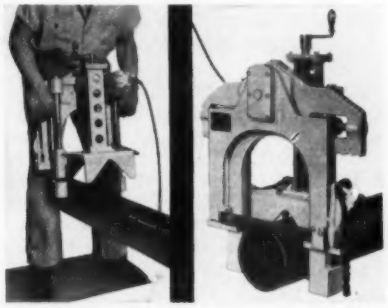
### Solenoid valve

A new series of midget solenoid valves for handling all types of gases and liquids, these new models are available for a variety of applications for control of fluids. The units are multipose, have soft seat, and tight shut-off construction. Among the new group are time delay, manual reset, 2-way on/off and 3-way valves. Individual units are designed to handle gas, air, oil, water and corrosive fluids. Aluminum, brass and stainless steel body metal used, to suit application. In stainless steel types, all internal parts are steel to assure long life.

*K-27, K-28, K-29.* General Controls Co., 801 Allen Ave., Glendale, Cal.

### Portable pipe saw

A portable power pipe saw for cutting of 2″ to 8″ cast iron and steel pipe on the job, this new unit weighs just 120 lbs. Op-



erating in a space 25″ wide it will easily make tough cuts in tight places, the manufacturer reports. In the field cuts can be made in a matter of minutes. A chain pipe vise clamps the saw to the pipe in a few seconds and the unit is ready for cutting. Machined cast steel V saddle base of the vise assures a square cut at right angle to pipe. Cutting time depends upon pipe characteristics, 6″ standard wall steel pipe is cut in 8 minutes, 6″ standard wall cast iron pipe in 4 minutes.

*Guillotine Pipe Saw.* The E. H. Wachs Co., 1525 No. Dayton St., Chicago 22.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*A typical Draketown Propane Plant for augmentation and standby*

Whether your load is large or small, you will find a Draketown design to meet your specific requirements. Ready at the turn of a valve—completely automatic if you wish—accurate and dependable—your Draketown Plant keeps that pressure up when things get rough.

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## GAS INDUSTRY CALENDAR

### September

7-10 Pacific Coast Gas Association, Vancouver and Georgia Hotels, Vancouver, British Columbia.
8-10 Mid-West gas school and conference, Iowa State College, Ames, Iowa.
8-11 AGA operating section, organization meetings, Hotel New Yorker, New York.
10 New Jersey Gas Association, Hotel Monmouth, Spring Lake, N. J.
13-14 Independent Natural Gas Association of America, annual meeting, Roosevelt Hotel, New Orleans, La.
17-18 Maryland Utilities Association, fall conference, Virginia Beach, Va.
24 Oklahoma Utilities Association, gas division meeting, Biltmore Hotel, Oklahoma City, Okla.
27-28 International Gas Union council meeting, Dusseldorf, Germany.
28-29 Texas Mid-Continent Oil and Gas Association, Baker Hotel, Dallas.

### October

9 AGA board of directors, Atlantic City, N. J.
11-13 AGA annual convention, Atlantic City, N. J.
18-22 National Safety Council, Chicago.

### November

1-5 National Metal Exposition, Chicago.
4 Midwest Industrial Gas Council, fall meeting, La Salle Hotel, Chicago.
8-11 American Petroleum Institute, Conrad Hilton Hotel, Chicago.
8-12 National hotel exposition, Kingsbridge Armory, New York.
17-19 Wisconsin Utilities Association, gas and electric sections convention, Schroeder Hotel, Milwaukee, Wis.
17-19 Southeastern Gas Association, Sir Walter Hotel, Raleigh, N. C.
28-December 3 The American Society of Mechanical Engineers, Statler Hotel, New York.

### December

6-7 SGA advisory council and management conference, Point Clear, Ala.

### January, 1955

13-20 National housewares & home appliance exhibits, Navy Pier, Chicago.

### February, 1955

7-11 Western winter radio-television and appliance market, Western Merchandise Mart, San Francisco.
13-15 Mid-winter conference, public utility buyers, National Association Purchasing Agents, The Shamrock, Houston.

### March, 1955

7-9 Mid-West Gas Association, St. Paul Hotel, St. Paul, Minn.
24-25 AGA gas supply, transmission and storage conference, Wm. Penn Hotel, Pittsburgh.
24-25 Oklahoma Utilities Association convention, Mayo Hotel, Tulsa, Okla.
24-25 New England Gas Association, annual meeting, Hotel Statler, Boston, Mass.

### April, 1955

12-14 AGA sales conference on Industrial and commercial gas, Hotel Statler, Boston, Mass.
12-15 AGA distribution, motor vehicles and corrosion conference, Netherland Plaza, Cincinnati, O.
19-21 Southwestern gas measurement short course, University of Oklahoma, Norman, Okla.
25-27 Mid-West regional gas sales conference, Edgewater Beach Hotel, Chicago.

### May, 1955

2-6 AGA industrial gas school, Wm. Penn Hotel, Pittsburgh.
9-13 National restaurant exposition, Navy Pier, Chicago.
16-18 Southern Gas Association, New Orleans, La.
23-25 GAMA annual meeting, Ambassador Hotel, Los Angeles.
23-25 AGA chemical, engineering and manufactured gas production conference, Hotel New Yorker, New York.

### June, 1955

5-9 Canadian Gas Association, annual meeting, General Brock Hotel, Niagara Falls, Ontario, Canada.
9-10 Natural Gas and Petroleum Association of Canada, Royal Connaught Hotel, Hamilton, Ontario, Canada.
26-29 Michigan Gas Association, Grand Hotel, Mackinac Island, Mich.

## PROFESSIONAL DIRECTORY


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